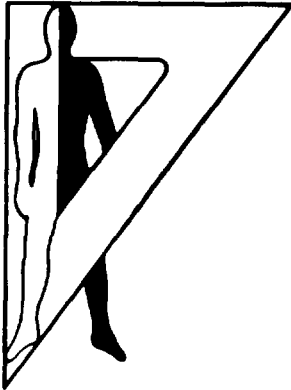


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Technical Memorandum 5-87

MODERN EXPERIENCE IN CITY COMBAT

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March 1987  
AMCMS Code 612716.H700011

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Aberdeen Proving Ground, Maryland

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## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No 0704-0188  
Exp Date Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			Approved for public release; distribution unlimited.		
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION Abbott Associates, Inc.	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION			
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 2124 Springfield, VA 22152-0124			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Human Engineering Laboratory	8b. OFFICE SYMBOL (If applicable) SLCHE	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER			
8c. ADDRESS (City, State, and ZIP Code) Aberdeen Proving Ground, MD 21005-5001			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
			WORK UNIT ACCESSION NO.		
11. TITLE (Include Security Classification) MODERN EXPERIENCE IN CITY COMBAT					
12. PERSONAL AUTHOR(S)    McLaurin, R.D.                      McDonald, David S. Jureidini, Paul A.                      Sellers, Kurt J.					
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) March 1987		15. PAGE COUNT 113	
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Urban Warfare                      Military Operations on Urbanized Terrain		
15	06		MOUT                                      Combat in Cities		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>This report systematically identifies and addresses dominant factors historically affecting the course and outcome of Military Operations on Militarized Terrain (MOUT). The report analyzes twenty-two selected urban battles fought between 1942 and 1982. The selected battles represent a broad range of combatants and geographical regions under conditions of both limited and unlimited combat. The analysis relates battle outcomes to such variables as each opponent's size, force structure, and tactics, as well as city size, battle duration, the combatants' relationships to the population, and limitations on combat.</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Doris S. Eanes			22b. TELEPHONE (Include Area Code) 301-278-4478	22c. OFFICE SYMBOL SLCHE-ST	

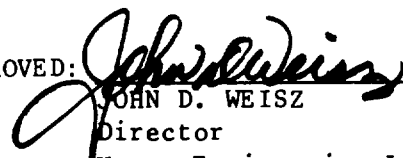
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Aberdeen Proving Ground, Maryland 21005-5001

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## EXECUTIVE SUMMARY

This report provides insights into the nature of dominant factors affecting the course and outcome of combat in Military Operations on Urbanized Terrain (MOUT) through a systematic examination of historical accounts of such activity. This research was based on 22 cases of urban conflict including:

Aachen	Cherbourg	Seoul
Arnhem	Hue	Sidon
Ashrafiyeh	Jerusalem	Stalingrad
Ban Me Thuot	Khorramshahr	Suez City
Beirut I (Hotel/Port)	Manila	Tel Zaatar
Beirut II	Ortona	Tyre
Berlin	Quang Tri I	Zahle
	Quang Tri II	

It can be misleading to attach a great deal of emphasis to the study of a case population which is too small to generate incontrovertibly reliable data. This report merely gathers observations from a reasonable number of MOUT engagements and attempts to identify any patterns.

The results suggest that current doctrine is well-founded in advising attacking American forces to avoid cities where this is feasible. The data also suggest that a well-conceived attack on urban terrain will be successful. Such an attack is not necessarily overly expensive in casualties or resources, depending upon a number of factors, several of which are not under attacker control. What the city does consume in almost every case is time. Isolating and encircling a city, however, may prevent the prolonged battle for control of it from slowing the overall offensive. In cases where attackers enjoyed a 4:1 advantage or greater in personnel, even major cities did not consume more than two weeks' time on the average.

It is not clear whether the attacker needs to allocate personnel at the rate of 4 (attacker):1 (defender). The required size of the attacking forces is dependent on the quality of intelligence, degree of surprise, and degree of superior firepower (air, armor, artillery) the attacker can achieve versus the degree of sophistication with which the defender has prepared the city. Also important is whether the defender is alien from the local population, is wholly or partially cut off from external support, and has effective communications systems. Defense in a built-up area does not appear to be a better risk than defense on other terrain in terms of ultimately holding the ground. However, defense of cities, especially large cities that an attacker cannot avoid, does appear to offer unique advantages to the defender. A well planned defense, even if cut off, or lacking in air, armor, or artillery weapons, can consume inordinate amounts of the attacker's time. This time can permit the defender to reorganize, redeploy, or otherwise more effectively marshal resources in other areas.

The "odds" favoring an ultimate attacker victory do not materially increase once the attacker's force advantage exceeds 2:1. Further increasing the attacker's force advantage, however, lessens the amount of

time needed to seize the city. In cases where the attacker enjoyed a 4:1 or greater force advantage, even battles for major cities did not consume an average of over two weeks.

Despite the relationship between force ratio and combat duration, preparation of the city for defense can offset some of the defensive force ratio disadvantage. Careful planning and construction of defensive positions, kill zones, and obstacles can extend urban combat for several weeks in a major city. In fact, most of the battles studied (2/3) were not characterized by force ratios of 4:1 or greater. Where two regular armies confronted each other, 86 percent of the cases were characterized by an attacker advantage of 3:1 or less. Defensive forces in large cities can put up stiff resistance under these circumstances without reinforcement, especially if the defense of the city has been prepared in advance.

Superiority in specific combat areas does not seem to be significantly related to a successful outcome. From the attacker's point of view, air and armor superiority appear to be of roughly equal weight, but have very different implications. Control of the air is important for the protection of attacking forces more than for the destructive power that can be unleashed through air attacks. A second important role of air power is to cut off the city from sources of supply, reinforcement, and evacuation. It appears that the psychological utility of bombing can be great depending upon the character of the defending forces and their perceptions and expectations. The psychological effects of aerial bombardment appear to increase to the degree the defenders are surprised by an unanticipated attack or are inexperienced or inadequately trained or organized. Air attack is further demoralizing to defenders who initially hold high expectations of victory.

The belief that armor has no role in city fighting is erroneous. These cases show that the role of attacking armor is important, particularly at the outer perimeter in operations to isolate a city. The defender may also use tanks on the outer perimeter to delay or prevent isolation. The defender, however, will place greater emphasis on the antitank (AT) missile. Tanks and armored personnel carriers (APCs) have also proven vital to the attacker inside the city as long as they were protected by dismounted infantry. Many cases in World War II and the IDF (Israeli Defense Forces) experience in the 1982 battles in Lebanon illustrate very clearly that armor can be invaluable in cities. U.S. experience in Hue also demonstrates the prominent role armor can play.

Artillery, like armor, has two distinct roles: outside the built-up area to isolate or prevent isolation, and within the built-up area to provide direct-fire support. New tactics and equipment emphasizing the use of self-propelled (SP) artillery in the direct-fire role (not in itself a new tactic) undergird the special value of artillery in cities. By contrast, indirect fire support is more problematical. It is apparent that indirect artillery must be concentrated in volume against a small target area to be truly effective. Even so, indirect artillery fire, like air attack, is significant for its psychological impact.

General or relatively unlimited wars are the only situations in which the attacker has extremely favorable advantages over the defender in MOUT.

Conversely, if the attacker is subject to any major constraints, the defender has a good chance to win or at least prolong the battle and raise the cost for the attacker. This is true regardless of force balance factors. These constraints might include the following:

1. Limiting friendly military casualties.
2. Minimizing civilian casualties and/or collateral destruction to
  - a. Avoid alienation of the local population.
  - b. Reduce the risk of adverse world or domestic opinion.
  - c. Preserve facilities for future use.

Modern weaponry may affect the outcome of future urban combat. It appears that tanks, whose vulnerability in cities was evident even in World War II, are today more vulnerable to a wider range of better AT munitions. At the same time evolution and proliferation of new tank weapons and ammunition give armor more destructive firepower. There is also some evidence that the newest families of air-to-ground munitions may be giving the air arm a viable tactical role in MOUT, although it is premature to render any verdict yet. In an unlimited war environment, the attacker may have gained a slight edge, but in a limited war it appears the defender has gained.

The priority for both attacker and defender on the ability to control military operations in highly decentralized circumstances remains the same. Personnel training and motivation continue to be as important as equipment or force balance factors.

Equally important is the requirement for truly combined arms operations, especially for the attacker. The infantry has long been thought to be the primary combat arms branch in city fighting. It is true that the foot soldier's role is unique and somewhat different in urban areas, but so are those of armor and artillery. Moreover, several of the cases reaffirm the necessity for the various branches to plan, train, and develop doctrine together. Infantry requires fire support against strongpoints no more or less than armor and SP artillery need protection by infantry.

## LIST OF TERMS AND ABBREVIATIONS

AA - antiaircraft  
 AAA - antiaircraft artillery  
 AP - armor piercing  
 APC - armored personnel carrier  
 ARVN - Army of the Republic of Vietnam (South Vietnamese army)  
 AT - antitank  
 ATGM - antitank guided missile  
 C2 - command and control  
 C3 - command, control, communications  
 C3I - command, control, communications, and intelligence  
 CAS - close air support  
 Flak - antiaircraft gun (German abbreviation of "Flugabwehrkanone")  
 CBU - cluster bomb unit  
 HE - high explosive  
 HEAT - high explosive, antitank  
 IAF - Israeli Air Force  
 IDF - Israeli Defense Forces  
 Katyusha - generic slang for any model of Soviet 122mm MRL  
 km - kilometer  
 LAF - Lebanese Armed Forces (national military forces)  
 LOC - line of communications  
 Luftwaffe - German Air Force  
 MACV - U.S. Military Assistance Command, Vietnam  
 mm - millimeter  
 MOUT - military operations on urbanized terrain  
 MRL - multiple rocket launcher  
 NKVD - Soviet secret police, forerunner to the KGB (Russian acronym)  
 NVA - North Vietnamese Army  
 Panzerfaust - "armor fist," German WWII shoulder-fired antitank weapon  
 pdr - pounder, British classification of artillery by projectile weight,  
     e.g., 6 pdr gun  
 PFLP - Popular Front for the Liberation of Palestine  
 PIAT - Projector, Infantry, Antitank, British World War II shoulder-fired AT  
     weapon  
 PLO - Palestine Liberation Organization  
 RPG - Soviet shoulder-fired antitank rocket launcher (Russian acronym)  
 RAF - Royal Air Force (British)  
 ROK - Republic of Korea (South Korea)  
 RR - recoilless rifle  
 SA - surface-to-air, when followed by a number is used as the western model  
     designation for Soviet SAMs, e.g., SA-6, SA-7  
 SAM - surface-to-air missile  
 sapper - assault engineer, primarily associated with demolitions use  
 sniper - herein generically applied to describe individual riflemen. True  
     "snipers," i.e., trained specialists with telescopic sights, will be  
     clarified as such where appropriate  
 SP - self-propelled

SS - Schutzstaffel (Protection Echelon), originally Hitler's bodyguard, in addition to police and security functions a distinct element (Waffen-SS) formed a separate branch of the armed forces.

SU - Russian generic acronym for an SP gun, is usually followed by a number to indicate the specific model by gun caliber in millimeters, e.g., SU-76, SU-100

SVD - Soviet 7.62mm sniper rifle with telescopic sight (Russian acronym) T34, T55, etc. - model designations for Soviet tanks

VC - Viet Cong (South Vietnamese communist)

ZSU-23-4 - Soviet self-propelled quadrapal 23mm AA gun (Russian acronym)

ZU - Russian generic acronym for an automatic antiaircraft gun, usually followed by a number to indicate the specific model by gun caliber in millimeters, e.g., ZU-23, a second number may be used to indicate the number of barrels, e.g., ZU-23-2

## MODERN EXPERIENCE IN CITY COMBAT

### I

#### INTRODUCTION

Over the past few years, the relevance of built-up areas on the planning, tactics, communications, and weapons effectiveness of military operations has gained increased attention. For example, research has been devoted to evaluating recent experience in relatively large scale engagements such as the June 1967 and October 1973 Middle East wars, the Lebanese civil war, and the 1980-1981 Persian Gulf War. Efforts have been made to improve training methods, lessons, and facilities; and to create weapons systems, ammunition, or ancillary equipment suited to both urban environments and other situations.

Parameters of interest in combat in urban areas have been determined to some extent by the salience of military branch roles and conditioned by a widespread desire to avoid such combat. However, evidence in previous conflicts shows urban fighting inherent in major wars. Combat in built-up areas cannot be avoided and, in the circumstances of the contemporary balance in Western Europe, may be a force multiplier for NATO against attacking Warsaw Pact forces. Virtually all major wars involve city fighting important to the outcome of the war. In addition, and this point is frequently overlooked, combat in built-up areas has historically involved and affected all combat arms, combat support, and combat service support elements.

While progress in MOUT studies has enabled Army planners to develop some new doctrine and to begin to move toward urban combat training, all these efforts and other related activities (e.g., MOUT games) should reflect lessons learned. One problem in integrating these lessons is the issue of their relevance to contemporary combat. We have a wealth of historical data from World War II, but we do not know how valid it is under contemporary conditions (i.e., with modern weapons systems and current organization).

Since World War II a substantial element of ground forces technology has emphasized precision, speed, and long-range accuracy. Yet, some work done on World War II cases at the U.S. Army Human Engineering Laboratory suggests these factors, whatever their importance in combat on open terrain, may not be associated with success in the urban environment. Research conducted by the authors on the fighting in Beirut (1975-1978) showed that combatants placed great value on some older weapons systems such as the M-42 40mm SP (self-propelled) antiaircraft gun and were less enthusiastic about some more "advanced" systems.

Few of the studies of city battles during and since World War II have specifically focused on those factors that seemed to determine tactical success in the unique urban environments in which they unfolded. This study addresses some of the basic issues of fighting in built-up areas,

focusing on trends and dominant factors, in the context of 22 case studies.

#### PURPOSE

The purpose of this report is to provide critical insights into dominant factors affecting the outcome of combat in urban terrain by systematically examining historical accounts and to provide a series of findings on MOUT which reflect the dominant factors influencing these outcomes.

#### ORGANIZATION OF THIS REPORT

This report is divided into four chapters and appendixes. The first chapter introduces the study, explains its conceptual underpinnings and purpose, and describes the organization and structure of the report. The second chapter addresses methodology. The approach is described, the covered subjects are discussed, and the cases enumerated and summarized. The third chapter presents the analysis in six sections - engagement, tactics, armor, artillery, aircraft, and outcome. The final chapter summarizes the findings and conclusions emerging from the research. This is followed by a relatively comprehensive bibliography on the cases. Appendix A presents a brief overview of each of the 22 cases studied in this project. A statistical summary of the cases is presented in Appendix B. Finally, Appendix C contains a list of hypotheses generated to support the research.

## II

### METHOD

The general approach used was to review the studies of recent MOUT operations studies; to cull out principles of these operations; to articulate these principles as hypotheses or independent variables; and to apply these principles to World War II and post-World War II cases to determine the nature and degree of their universal validity.

Each combat situation is unique. Nevertheless, it is clear that general principles of war exist. There is reason to believe that general principles of urban combat also exist. It is just as important to identify cases where the principles do not apply as it is to find cases where they do apply. Where appropriate, that is, applicable to a reasonable population of cases, suitable subcategories were created--for example air power versus absence of air power.

### APPROACH

The research was carried out in three parts. The first task was identification and review of the cases. Established parameters for identification of cases involved both mandatory and desirable characteristics. The cases must include at least one from each major World War II front except North Africa; at least one from the Korean War period; at least one from Vietnam; and at least four from the post-Vietnam period. Desirable characteristics were: employment of air power on at least one side; forces totaling one battalion or more; city population of 50,000 or more; use of at least some modern (as of the date of battle) weapons support systems. Most cases met all or most of the desirable characteristics criteria.

In the second task, a number of principles were identified based upon the selected cases and upon the recent literature on MOUT. These principles were then framed as hypotheses in order to carry out the final task of the research.

In the third task, each principle was independently validated for each battle. A determination was made whether the hypothesis was supported by the course of that battle. If the hypothesis was not supported, an analysis was made to determine what factors appeared to have invalidated the hypothesis in that case and whether further specification of the hypothesis would alter the result. In addition, and in the context of the validation of the hypotheses, each case was studied to determine the dominant factor in outcome.

It was anticipated that in many cases the validation of several hypotheses would not be possible due to lack of data. However, it was

believed that the robustness of most hypotheses would be verifiable on the basis of an adequate remaining population.

Operationalizing the research required defining several key terms. The most clear-cut case is that of a "win." It is not self-evident who really "won" many battles. Not that the outcome is in doubt. The question is whether to identify a win in terms of combatant objectives, overall impact on the campaign, or in terms of some more tangible and comparable criterion. In this research, a "win" is determined by the combatant holding the contested terrain at the conclusion of hostilities. The utility of this criterion is debatable and is therefore discussed below.

There are some important advantages to the use of combatant objective as the "win" criterion. First, and most important, combatants enter specific combat environments not necessarily to hold onto a specific piece of terrain but rather to accomplish some objectives, usually tactical, that may be deemed supportive of the strategic interest. Consequently, since the objective is often not to hold terrain, it seems hardly appropriate to judge the effectiveness of the military effort on this basis. An alternative and equally attractive criterion may be the overall campaign impact of a specific battle. Such a criterion reflects the fact that whatever the initial tactical objective of the combatants, the strategic outcome is important. Moreover, the course of combat often reflects shifting priorities and objectives, but at all times both sides are presumed to be optimizing their positions.

Examples of combatants' objectives or campaign impact criteria are readily available even within our statistically small number of cases. A primary objective of the Allied Forces attacking Cherbourg in World War II was certainly to secure the use of this port. The Germans defending Cherbourg, by contrast, did not wish to see the intact port in Allied hands. Thus, the Germans effectively demolished the port facilities before surrendering. In terms of these competing objectives, Cherbourg can certainly be considered a German (defender) "win" and an attacker (U.S.) loss. Khorramshahr is an even more compelling example of the value of campaign impact as criterion. The local Iranian defenders sought to hold the city but fought largely without clear tactical or strategic objectives. Indeed, the Iranians withdrew the only organized forces from the city at an early point in the battle. Nevertheless, the month consumed by Iraq to capture Khorramshahr effectively provided Iran the time necessary to reorganize and redeploy forces. The delay was especially significant because of the seasonal rains that stalled the Iraqi offensive just weeks after Khorramshahr's fall.

Using objectives or campaign impact as a criterion also has grave shortcomings. First, each party typically has several objectives; which is to be given priority? Objectives may vary. Higher headquarters may have one set, the local commander a very different set. Whose is to prevail? Second, it is not uncommon to find distinct differences between objectives given before or at the time of the battle and those provided post facto. Is one to infer self-serving reasons, for some stated objectives and to ignore them? The campaign impact approach is even more elusive. How can

one measure the impact of a battle in an overall campaign? How, for example, does one compute the psychological impact in the United States of the Battle of Hue? or the value the PLO (Palestine Liberation Organization) derived from the length of its Beirut resistance to Israel?

These two alternative criteria are not only internally problematical (with several different conclusions resulting from different objectives, different actors' perceptions, different impact realms, and so forth), but are often externally in conflict with each other as well.

By contrast, it is clear in every case that the defender would have chosen to retain control of the city had it been possible. The criterion of control at cessation of active hostilities is at least as reasonable as and infinitely more tangible than the two alternatives. However, no one criterion alone is reliable. Appendix B, Table 11, covers the 11 battles in which specific city battle outcome could be affected by the alternative criteria of objectives or campaign impact. In only four of the eleven cases is there a strong argument that a different "winner" could be selected in consideration of either or both alternative criteria. Even in these four cases - Beirut 1982, Cherbourg, Hue, and Khorramshahr - the argument for "winner" based on control of the contested terrain is at least as persuasive. In the other seven cases, the "winner's" identity does not change.

## TOPICS

The specific hypotheses are listed in Appendix C. These hypotheses may be grouped into several categories: operational concepts, course of combat, tactics, armor, artillery, air, and outcome. Three of these "topics" are in fact combat arms branches. Most of the literature on MOUT focuses on infantry operations, as most writers and analysts have seen urban combat as small-unit operations dominated by personnel on foot. Recognizing this perception exists, special attention was given to determining the extent to which the other combat arms played a central role in the actual cases.

The analysis in Chapter III is based upon the range of topics we have identified, with each as a subheading. The first section deals with the concept of fighting or avoiding combat in a specific built-up area; the concepts of operation of attacker and defender, the course of combat, the variables influencing battles in cities, and the issue of a "model" or paradigm.

The second section, tactics, deals with the degree to which city services (utilities, transportation, food, and so forth) were incorporated in either the planning or the conduct of the operation, the use of key buildings and intersections, strongpoints, offensive assault teams, defensive roving antitank (AT) teams, and snipers.

The third section, armor, addresses the employment vulnerability of tanks and APCs. Despite some disastrous experiences, actual combat repeatedly demonstrates the value of armor in MOUT when employed in combination with other arms.

The fourth section, artillery, considers direct and indirect fire roles, problems of indirect fire effectiveness, and the special uses of self-propelled artillery and air defense weapons. Aircraft topics addressed in the fifth section include area bombing, close air support, interdiction, and helicopter roles.

In the sixth and final section of Chapter III, outcome, we focus on statistical and other relationships between a number of variables and combat outcome. Particular attention is given to the several operational meanings of success.

## CASES

This study is built on data based on 22 cases geographically distributed among Europe (6 cases or 27 percent), the Middle East (10 cases or 45 percent), and East Asia (6 cases or 27 percent). The European cases are all of World War II vintage. These cases are listed below:

Aachen	Manila
Arnhem	Ortona
Ashrafiyeh	Quang Tri City I
Ban Me Thuot	Quang Tri City II
Beirut Port/Hotel (I)	Seoul
Beirut 1982 (II)	Sidon
Berlin	Stalingrad
Cherbourg	Suez City
Hue	Tel Zaatar
Jerusalem	Tyre
Khorramshahr	Zahle

Of the cases, 7 (32 percent) occurred during World War II, 10 (45 percent) since 1975. Two cases (9 percent) were relatively static cases, and the rest (91 percent) involved at least some movement. Total committed force sizes varied from about one battalion (5 percent) to over one division (60 percent). The duration also varied, but well over half of them lasted more than a week. These and other characteristics are systematically examined in Appendix B. A very brief summary of each case follows. (More extensive summaries are found in Appendix A.)

Aachen (1944). The symbolic importance of this first major battle on German soil ensured bitter resistance against the American attackers. The Germans surrendered only after the city was totally destroyed.

Arnhem (1944). A British airborne division made a surprise landing near this Dutch city to seize a bridge over the Rhine River for advancing British forces. Unexpected German armor counterattacked and eliminated all footholds, virtually destroying the British division before the linkup could be made.

Ashrafiyeh (1978). The Syrian Army siege of Lebanese forces in East Beirut was essentially an artillery bombardment without air attacks. Final positions remained unchanged.

Ban Me Thuot (1975). This highlands town was the first strategic city to fall in the final, decisive North Vietnamese general offensive. South Vietnamese forces were surprised and overwhelmed.

Beirut I (1976). This was a series of small, local operations between largely irregular Christian and Muslim forces fighting over control of the hotel and port districts. Combat was not decisive, but led to changes in the "Green Line" separating the antagonists and subsequent stagnation of the Lebanese conflict.

Beirut II (1982). Israeli forces concluded the Lebanese campaign against the PLO (Palestine Liberation Organization). Fighting under domestic and world political pressures, the IDF (Israeli Defense Forces) besieged the PLO, selectively applying heavy ground and air firepower in conjunction with psychological warfare and limited objective ground operations. A negotiated PLO evacuation from the city resulted.

Berlin (1945). The long, bloody Soviet offensive to seize the city effectively concluded the "last battle" of World War II in Europe. Bitter fighting occurred, but the defense was never well coordinated due in part to poor preparation by the Germans.

Cherbourg (1944). German forces in the Cotentin Peninsula were cut off in this French port city. After much fighting, particularly in strongpoints outside the city, the German garrison surrendered to the Americans. The port facilities were completely destroyed to prevent early Allied use.

Hue (1968). Vietcong and North Vietnamese forces seized parts of the walled city (Citadel) during the Tet offensive and held it about 3 weeks against intensive U.S. and South Vietnamese attempts to retake it.

Jerusalem (1967). Israeli forces seized the city in a well-prepared and executed operation. Despite an uncoordinated Jordanian defense, Israeli casualties were the highest of the Six Day War. Regular Jordanian forces withdrew during the latter stages of the battle effectively ending organized resistance.

Khorramshahr (1980). Iranian regular forces initially evacuated the port city in the face of an Iraqi offensive. Irregular Iranian forces, however, offered prolonged resistance and inflicted heavy casualties. Iraq eventually won this avoidable battle, but at a cost in time and resources that ultimately served to halt the entire offensive against Iran.

Manila (1945). Japanese Army troops evacuated Manila, but the local naval commander unilaterally decided to hold the city at all costs with poorly trained and equipped personnel. Excessive resistance resulted in high costs to the U.S. victors and destruction of the city and much of its population.

Ortona (1943). Determined German resistance in this Italian town against Canadian attackers demonstrated the difficulty of overcoming a well prepared defense. The German forces eventually withdrew.

Quang Tri City I and II (1972). Seizure of this northernmost major South Vietnamese city was an objective of the North Vietnamese 1972 Winter-Spring offensive. The NVA (North Vietnamese Army) overwhelmed the ARVN (Army, Republic of Vietnam) defenders (I), but later the city was recaptured (II) by a smaller ARVN force, albeit with extensive artillery and air support. The large conventional forces involved on both sides make these the major urban battles of the Vietnam War.

Seoul (1950). Following the Inchon landing, U.S. and ROK (Republic of Korea) forces recaptured the South Korean capital from the North Koreans. The fighting was unusual in that combat was largely centered on seizure of street barricades rather than buildings.

Sidon (1982). Israeli forces easily seized this PLO southern headquarters during the invasion of Lebanon. The IDF was fully prepared for major urban combat using lessons learned from earlier battles, but resistance was unexpectedly light as PLO forces had largely withdrawn from the city.

Stalingrad (1942-43). (For the scope of this paper, only combat from August - November 1942 is analyzed.) The tenacious Soviet defenses cost the Germans dearly in every way, and set up a decisive counteroffensive. This classic urban battle involved large forces and saw all types of MOUT combat techniques.

Suez City (1973). Israeli forces were defeated in an attempt to seize this Egyptian city prior to the anticipated UN ceasefire to the October War. IDF armored shock tactics led to disaster against a well-prepared Egyptian defense. High casualties forced the IDF to withdraw from the center city.

Tel Zaatar (1976). Lebanese Christian attackers encircled and leisurely besieged this Palestinian camp, prior to overcoming its defenders with a final assault.

Tyre (1982). The Israeli attack on the PLO in this Lebanese coastal city was well-planned, with excellent intelligence on the target. All branches of the IDF participated in an operation that included naval fire support and amphibious landings. PLO resistance was uncoordinated and relatively easily overcome.

Zahle (1981). Syria laid siege to the Lebanese Forces and militia in this key crossroads town. Fighting was inconclusive and ended in a negotiated settlement whereby the Lebanese defenders evacuated the town.

### III

#### ANALYSIS

This chapter compares and analyzes the 22 instances of urban combat on which this study is based. Considering the extended period of time encompassed by the research, it is notable that relatively few cases appear that can be considered "representative" of urban combat. This is due only partly to chance. Rather, it is largely a function of the uniqueness of each battle. Every battle studied in this work has one or more major shortcomings as an example. There are "typical" city battles; each is unique.

The 22 battles selected here were chosen to provide reasonable coverage of attacker and defender victories, large and small cities, World War II and post-World War II periods, limited and general wars, employment and absence of air and naval support, assaults and sieges, long and short duration battles, and different combatant doctrines. It was not possible, however, to collect a large number of cases that individually cut across many categories. Therefore, World War II period battles are general war incidents, and the instances of urban conflict in limited war are subsequent to 1949. Air and naval support are more predominant in general war than in limited war.

In spite of the limitations indicated above, the 22 cases of military operations on urban terrain constitute a substantial and reasonable collection of recent experiences. They are synopsized in Appendix A. Some relevant characteristics are noted below:

Battles: 22	Alien attackers: 19
World War II: 7	Defense cut-off (Partially or wholly): 14
Korean War: 1	Attacker wins: 16
Post-1960: 14	Defender wins: 5
Post-1970: 12	Draws: 1
Post-1980: 4	Duration 1-5 days: 5
Air support present: 17	Duration 6-13 days: 5
Naval support present: 7	Duration 14-30 days: 5
"Alien" defenders: 9	Duration over 30 days: 7

Despite the wide variance of the sample, there are several clear-cut trends. The attacker wins, but at high cost, the battle lasts over a week, and there is little systematic relationship between force ratios or force structure and outcome.

#### ENGAGEMENT

It is not surprising that the attacker wins most city combat incidents since the attacker chooses the time and place of attack. Clearly, the attacker is unlikely to initiate a battle he will lose under normal circum-

stances. All cases where the defender won in constant combat (rather than "intermittent sieges")--Arnhem, Stalingrad, and Suez City--involved serious intelligence errors on the part of the attacker. Indeed, Arnhem and Suez City might not have been attacked had the offense appreciated the actual defending forces available. (Defender intelligence failures played a role in a number of attacker victories as well.)

American military doctrine has generally supported avoiding conflict in urban areas if possible. History has shown clearly, however, that when U.S. forces are in the offensive role urban areas are often central to a campaign. Consequently urban areas must be contested for one or more of the following reasons:

- the city lies athwart a major line of communication (LOC).
- enemy concentrations in the city are too powerful to by-pass and leave to the rear of friendly forces
- city assets are important to the campaign
- the city has symbolic (political) importance

On the defensive, friendly forces may find the urban area useful as a force multiplier because urban terrain tends to reduce the mobility, firepower, and protection advantages of armor-heavy offensive armies.

Review of the 22 city battles does not help to examine the utility of the city battle. Considering the outcomes of 16 attacker wins one could easily conclude that the defensive value is exaggerated. However, the fact that an attacker "wins," that is, captures the contested area, does not consider cost. The cost to the attacker was considered high in the majority of cases. Attacker cost was deemed high in casualties, time, and resources, respectively, in 68, 55, and 59 percent of the cases studied. ("High cost" is, of course, relative to the percentage of total resources and time expended and the results achieved. A high cost does not necessarily imply that the results were not worth the price.)

Although casualties were most frequently mentioned as a significant cost item, in no single case did casualties in the city itself alter overall campaign outcome. However, the time consumed in urban combat in Khorramshahr, and arguably in Stalingrad, played a significant strategic role in the general course of hostilities. The same may be said about the political outcome of the siege of Beirut in 1982.

The idea of avoiding the city where possible is based on the perception that the city consumes attacker resources (whether the resource is human, material, or time). As we have seen, this perception is valid. However, it is not always valid. In three cases--Ban Me Thuot, Sidon, and Tyre--capture of a city was inexpensive in all respects. Moreover, Tel Zaatar was won with little cost except in material resources. (Although the siege also consumed time, the time did not adversely affect the attackers in any significant way.) In Jerusalem, Quang Tri I, and Seoul, victories were expensive in lives, but not in time or material.

What can be concluded from this survey of 22 cases? From the point of view of the offense several factors appear to be important. First, overwhelming superiority is helpful if all costs are to be minimized. Second, photomaps and dependable intelligence are invaluable. It is critical to know whether and how the city has been prepared for defense. Third, and perhaps most importantly, the operation should be carefully planned. Fourth, attacking forces should understand the unique nature of urban combat. Clear doctrine concerning urban combat is critical. Every aspect ranging from taking a building to using destructive technology and coordinating combined arms must be understood. Finally, a helpful condition for attacker success is the isolation of the target. There are many tactical issues that determine the course of combat, but these five considerations appear to be the key to minimizing the cost from the attacker's viewpoint.

From the standpoint of the defender, the critical variable is clear: preparation of the city. The capture of a prepared city can be made extremely costly. Preparations can include creating kill zones, clearing fields of fire and constructing channelizing obstacles, establishing reinforcing and fall-back positions, decentralizing command and control, and organizing multiple movement routes above ground, between rooftops, and below ground in subways and sewers. Maintaining substantial supply lines and receiving artillery support are also valuable, but physical preparation of the city is clearly the most important variable for the defender.

The foregoing considerations have the greatest impact on limited war situations. Under conditions of general war the acceptable cost of seizing a city may be higher. If the attacker is prepared to accept casualties and the consumption of time that fighting in a built-up area engenders, he is in a stronger position than the defender. If minimal cost is a salient factor, however, the attacker is in a substantially more difficult situation.

History suggests that the attacker will generally win, and the failure to do so generally reflects classic military errors, not characteristics unique to cities. Three of the five defender "wins" in our sample are at least as attributable to major intelligence errors as to any other single cause. The battles of Arnhem and Suez City would probably never have occurred had the attacker known the strength and locations of the defender's forces. At Stalingrad, the attacking Germans were cognizant of the defending forces facing them in the Sixth Army's zone, but the build-up of Soviet forces in other areas of the front came as a strategic surprise.

In the broadest sense, all the case battles in which the attacker lost can be attributed to intelligence failures. Underestimating the defender's ability and determination rather than failures to identify the defender's material strengths and locations was a key attacker error at Ashrahiyeh, Zahle, and arguably, at Stalingrad as well. At Ashrahiyeh and Zahle, the Syrian army incorrectly assumed that heavy firepower alone would break the

will of the irregular defending forces. At Stalingrad, the unexpected Soviet build-up was still detected in time to withdraw for the trap. However, the ample evidence of a pending Soviet attack was discounted as a series of localized operations rather than a major counteroffensive to first surround an entire German army, and later to ensnare all the German forces in southern Russia. The German senior commanders did not believe their Soviet counterparts had the ability or inclination to conduct such an ambitious strategic maneuver.

In terms of "wins," leaving aside the issue of attacker cost, no single factor seems to be systematically correlated with attacker win. Force ratios or armor, artillery, and air superiority do not appear to systematically relate to outcome. This suggests that a defender who adequately prepares a city can reduce his need for resources to defend it. Although the defender will probably lose, he can exact a high cost in time or other resources for a relatively small investment. More significantly, there appears to be no compelling reason to increase the investment beyond the minimum necessary to employ the defense.

#### IS THERE A PARADIGM?

Chronological review of the 22 cases does not suggest a clear pattern of combat in built-up areas. Despite new weapons, tactical approaches developed over four decades do not reflect any significant or consistent improvement over those evolved in the course of World War II. The emphasis on combined arms operations as seen in recent successful cases (Sidon, Tyre) is anything but an innovation, having been adopted by World War II combatants in all major urban engagements. An "evolutionary" model, a concept of evolving MOUT practice, appears to have greater intellectual appeal than empirical validity. Indeed, the pattern that suggests itself is that lessons are often forgotten and the nature of urban warfare will surprise combatants who will then adjust to it. For example, the Israeli Army that was so conscious of MOUT problems likely to be encountered in Jerusalem in 1967 experienced one of its most humiliating moments in the debacle of Suez City a little over six years later. The same Army then carried out two masterful urban operations (Sidon and Tyre) yet nine years later. Its third major urban target in 1982 (Beirut) was handled much less skillfully.

While one cannot demonstrate the consistent evolution of a pattern of urban combat, some general trends are clear. These apparent trends are not consistently applicable to a predictable degree. They, however, are more common today and are especially more noticeable in cases where careful planning has characterized the attack or defense.

From 1942 to the present, shock units or special assault teams have been used by attackers (and often by defenders) with great success. These assault teams are characterized by integration of combined arms at battalion level and below. Control is further decentralized at lower echelons which can include down to squad level (e.g., an infantry squad

working with a single tank). Assault teams typically contain infantry with variable combinations of armor, artillery, or engineers. In our cases, there was no greater use of such units over time, but such units were used in cases where close combat was expected. The exceptions to this trend were artillery sieges or when resistance was not anticipated. Whether by design or plan, then, attackers resorted to shock teams under normal conditions from 1942 to the present. Yet, the composition of the teams varied, with organic armor or self-propelled (SP) artillery less frequently employed since 1967.

Sniping was also used with about the same frequency by attackers in the early years (1942-1967) and later (1968-1982). Offensive sniping is less common than defensive sniping, which occurs in most cases (91 per cent). Indeed for all major intents and purposes sniping can be considered an integral part of urban combat. Most reports unfortunately do not detail or distinguish the techniques of trained specialists as opposed to individual riflemen using sniping tactics. The latter instance is most common by far.

It may be argued that certain elements of a pattern to urban combat exist and that it is the diverse nature of the present population that hides that pattern. This suggestion may well be accurate, since the purposes of this study were best served by a representative variety in MOUT situations. Any consideration of a possible pattern and its applications and limitations, must recognize the variables involved. They include city size, structure (building) composition, control of airspace, force structure, force ratio, role of the battle in the overall conflict, surprise, weather, objectives, the civilian population, proximity to trafficable waterways, accuracy of intelligence, and restrictions on specific types of military action due to nonmilitary considerations (e.g., fear of destroying culturally important structures). Because many of those variables are open-ended, and most affect both attackers and defenders, the possible conflict scenarios are virtually infinite.

City Size. Cases in which city size played a role in the nature of combat included Berlin, Manila, and Stalingrad in World War II, and more recently Ban Me Thuot, Beirut I and II, Khorramshahr, and Tel Zaatar. In several instances the larger cities provided defenders constant opportunities for harassment and on-the-spot reorganization and redeployment. Cities became mini-campaigns with several independent battles of varying types carried out. This was true even in cities like Hue, where the battles inside and outside the walled citadel varied substantially. In cases of smaller battles, like Ban Me Thuot and Tel Zaatar, no possibility existed for the defender to marshal sufficient force or maneuver units to forestall the attacker indefinitely. (The unwillingness of attackers to accept casualties in the latter case prolonged the siege for an extended period.)

Structure Composition. The importance of structure composition is often overlooked in MOUT accounts because combatants avoid using easily destroyed structures for cover. However, this very fact tends to dictate to some extent the location of defensive strongpoints. One of the advantages to the Palestinians in moving north into Beirut in 1982 was the greater solidity of the buildings in the city. The surrounding Palestinian refugee camps were characterized by rather thin-walled, foundationless construction. Although these camps were fortified, the intention was never to hold the terrain against large-scale artillery and aerial bombardment.

Control of the Air. It is clear that the side that has air superiority will use it against a city. (Syria's denial of its air superiority in Lebanon reflects the tacit agreement between Israel and Syria about limits to Syria's military activity in Lebanon. While it is true that Syria enjoyed air superiority, its inferiority vis-a-vis a third power, Israel, was the decisive factor.) In what respect air power constitutes an effective weapon for city fighting is another matter. Nevertheless, the availability of air power, or the likelihood of its employment against either side, often affects the nature and timing of attack and therefore of defense.

Force Size. The very size of the force, especially on the attack, is a critical factor. We address the issue of relative balance below (cf. "force ratio"), but absolute force limits are an important consideration by themselves. Irrespective of armed opposition, a small military force cannot control a larger city in the sense of imposing its physical presence. (This does not mean that a small force cannot capture a large city, since there are many factors involved in victory. Rather, the point is that it cannot physically occupy large sections of a large city.) By contrast, the availability of a large military force provides many more options to the attacker and some to the defender. In Beirut I, the battles of the Hotel and Port districts, relatively few men on defense held disproportionate significance, but for most of the battle very small forces were attacking as well. The force available meant inability to concentrate force or firepower. Similarly, the very few troops available to the defenders were concentrated at a few locations and provided substantial resistance of these facilities for 1-1/2 days.

Force structure. Evidently, force structure also affects combat. For example, it is clear that command and control may be heavily influenced by the force structure. Numerous cases reflect force structure considerations. The fact that ARVN forces had no organic antiaircraft artillery (AAA) in Quang Tri I and II precluded their using this weapon against structures in which NVA elements were lodged. The commander recognized the utility of AAA, but had none at his disposal. In Suez City, the composition and organization of the main attack task force was a major contributing factor to the debacle that ensued. Yet, this organization was virtually necessitated by the force structure in armored units employed in the days preceding the attack.

Force ratio. Surprisingly, force ratio seems a less powerful explanatory variable than some other factors. Yet, historians, analysts, and combatants frequently turn to "force ratio" or "balance of forces" as the independent variable that is the dominant factor in the outcome of the battle under study. The fact that similar situations have resulted in different outcomes is overlooked. What may be important is the perception on the part of local commanders and combatants that the outcome is certain. The balance of forces does and must affect the nature of combat. An attacker, especially if numerically inferior overall, must concentrate to achieve local superiority at a chosen point. Conversely, the defender must concentrate sufficient (not necessarily superior) forces to prevent defeat in detail. The ability to clear and hold structures is also affected. In terms of the battle (but not necessarily the war), the side with a great preponderance of personnel or equipment can more easily afford casualties.

Role of the battle in the campaign. How military operations in cities are waged often has a great deal to do with the relationship of the urban battle to the overall conflict. The Germans invested enough in Stalingrad to win--had Stalin not decided to hold the city at all costs. Similarly, Hitler stubbornly refused to withdraw and the subsequent destruction of the German 6th Army changed the tide of the war on the eastern front. Israel chose to militarily evict the PLO from Lebanon, but political constraints on operations in Beirut resulted in a lengthy siege to attain that objective. Extensive media coverage of Beirut served to erode both domestic and international support.

Surprise. As in military operations on other terrain, surprise can also alter the course of combat. Few of the battles selected here were tactical surprises, although Suez City which surprised the offense and Ban Me Thuot which surprised the defense fall into this category. (The initial attack on Hue by VC/NVA forces would qualify, but the U.S./ARVN counter-attack, which is the battle studied here, does not.) Beirut II, Jerusalem, Quang Tri I, Seoul, Sidon, and Tyre were strategic surprises in varying degrees. Surprise is clearly an asset for the party planning it, but, as Arnhem shows, not necessarily a decisive one. When surprise is employed as a means to overcome other disadvantages it is especially important to maintain accurate intelligence. Tactical surprise by the attacker in urban areas can be used to preempt effective defensive preparation of a city. Surprise is much more difficult to achieve by the defender and often requires major failings by the attacker in the collection, analysis, or dissemination of intelligence.

Weather. In the era of air power, weather has become a major potential factor. Poor weather seriously hampered U.S./ARVN air operations in Hue and Israeli operations in Suez City. In both cases, the nature of ground combat was significantly affected by weather because of the inability to bring air support to bear at the desired times. Weather also played a telling role in the German defeat at Stalingrad.

Objectives. We have already discussed the importance of objectives in terms of defining "outcome." It is in this sense that objectives shape the course of combat. The Cherbourg case provides an excellent example. Hitler

had expected to hold Cherbourg much longer, if not indefinitely, against the U.S. assault. (In contrast, Rommel unsuccessfully requested that the divisions trapped near the city be permitted to break out rather than be sacrificed in its defense.) Surrender of the German forces, however, occurred after the harbor was completely destroyed. (And indeed the U.S. colonel charged with reopening the harbor called the demolition "a masterful job, beyond a doubt the most complete, intensive, and best-planned demolition in history.") Although the nature and intensity of the combat did not reflect German aspirations or military plans, it was conducted effectively in terms of the objective of denying immediate use of the harbor to the Allies.

The civilian population. Another factor that has influenced the tenor of combat is the population of urban areas. The size of the population (in turn related to evacuation considerations), its need for food, shelter, and medicine, its experience with military operations, and its cultural background, can influence the course of hostilities. Evacuation of residents from target cities has frequently preceded city capture, e.g., in Khorramshahr, and Quang Tri (I). (Contrast this with Stalingrad from which Stalin forbade evacuation on the grounds that Soviet troops would fight more doggedly if the population remained.) In some cases, the civilian population has been used as hostages (e.g., Manila, Sidon, Tyre, Beirut II). When the populace remains, it can impose heavy demands upon the administration resources of the attacker. Sizeable movements of threatened population can impede military operations on either or both sides. The chaos in Berlin is a good example of the problems that can arise in which civilians are trapped in large numbers in the actual fighting. In most cases, civilians manage to leave the city through one means or another.

Proximity to trafficable waterways. Whether the urban area is close to sea lanes or other trafficable waterways can also be important. These routes may be used for logistic support, reinforcement, evacuation, or naval firepower. Certainly, Soviet use of the Volga both in the defense of Stalingrad and later to support the counteroffensive was critical to the German defeat. Similarly, naval gunfire was employed by attackers in several cases, for example, Hue, Beirut II, Sidon, Tyre. The attacker must often seize valuable port facilities with minimal damage as in Beirut I, Cherbourg, Sidon, or Suez City. This affects targeting and selection of objectives within the port city.

Intelligence accuracy. The importance of good intelligence is well established in all facets of military operations. Intelligence collection is impeded by the very nature of urban terrain. The cityscape facilitates deception, masks deployments and supply dumps, and severely limits observation to relatively small and incomplete sectors. In addition, intelligence errors are often critical. Few subsequent tactical changes can overcome the far-reaching impact of a major intelligence error. The course of several battles studied here was altered or significantly affected by intelligence failures. (Interestingly, not all of the failures were made relative to forces actually in the city, but the errors became capital when unforeseen reinforcements entered the city battles.)

Proscriptions/constraints. City fighting may also differ from combat in other areas as a result of implicit or explicit limitations imposed to safeguard certain city assets, especially cultural assets. In Jerusalem, for example, artillery fire on the Old City was forbidden by both sides. Limitations were also placed on the use of firepower in Manila and Hue, but in both cases some of the restraints were lifted as attacker casualties mounted. Sectors of Beirut were kept outside the fighting in both Beirut I and II, though for different reasons.

Conclusions. It is evident that the variety of urban combat is endless given the number of these variables and leaving aside other considerations such as city layout, topography, minority groups, public utilities, etc.

## TACTICS

There is no systematically accepted tactical doctrine on MOUT, but most regular armies emphasize the importance of effectively managing truly combined arms operations in built-up areas. Even at Stalingrad, the earliest case in this study, it was clear that both attacker and defender saw ideal city operations as involving carefully coordinated combined arms. In the postwar world, Israel overstressed the role of rapid armored thrusts as the vanguard of the army. The nature of the combat environment and of the relatively primitive C<sup>3</sup> (command, control, and communications) of Israel's adversaries explains the IDF's emphasis to a large extent. The IDF armored branch was in the process of evolving its own MOUT doctrine when the October War began. This doctrine, which emphasized the shock effect of armor in a rapid advance through a city, was widely seen as responsible for the Israeli debacle at Suez City. The result: a new emphasis on combined arms in Israel. The 1982 attacks on Sidon, Tyre, and Beirut were excellent examples of effective combined arms operations.

American tactical doctrine distinguishes between the hasty and the deliberate attack. Elements of the former include location of a weak spot or gap in enemy defense, fixing forward enemy elements, and rapid movement through the gap or weak spot. Clearly, the objective in the "hasty attack" is to avoid lengthy combat in a city that is either lightly defended or can be bypassed at little cost. By contrast, doctrine for a deliberate attack, employed against a prepared urban area that cannot be bypassed, demands isolating the area, securing a foothold and systematic clearing.

Certain elements of Soviet attack doctrine against urban areas are consistent with U.S. doctrine. Most consistent, for example, is isolating the city. Soviet doctrine appears to put greater emphasis on air and artillery bombardment, but the ground attack focuses on flank and rear assaults, securing a foothold in the city, attacking key objectives to divide the defense, bypassing centers of resistance, and finally clearing. Soviet doctrine emphasizes the intensity of continued attack to wear down the defenders and generally assumes substantial use of armor and direct-fire artillery. Even the distinctions evident between the two approaches are largely mitigated by the discretionary operations available to the U.S. command who may elect to seize critical objectives, and bypass resistance, etc.

The nature of the selection process for our cases precludes judgment of the plausibility of the hasty attack, since sizeable battles were chosen that lasted at least one day. Even where cities were bypassed, for example, Sidon and Tyre, the battle in the city itself must be considered deliberate. Closest to an exception is Ban Me Thuot, where little opposition was expected or encountered, but even there the battle lasted over 30 hours at key points.

In only 4 of 22 cases was the city completely isolated, and all four of these cases are "special." In three of them, the defenders were irregular forces, and had therefore only rudimentary lines of communications. The fourth case is that of Berlin which was "cut off" in the sense that it was the last major bastion of Nazi Germany. In all four cases, the attacker won and won rather easily.

The most common case occurs when a built-up area is only partially isolated or is isolated relatively late in the urban battle. Over 60 percent of the cases involved some form of isolation, but 45 percent were characterized by partial or belated isolation. (Isolation as used here reflects almost complete cut-off of supply. Ashrafiyeh, Beirut I, Ortona, Quang Tri I or II, Seoul, or Stalingrad are not considered as isolated even though virtually all defenders were very substantially affected by severe restrictions on lines of communication). It appears unrealistic in most battle environments, particularly in hostile territory, to envision complete isolation of a city until enemy forces to the rear of the city are pushed quite far beyond its outermost boundaries. Total isolation doesn't appear necessary, since 80 percent of partial isolation cases were attacker wins. By contrast, the attacker won in only 50 percent of the eight cases where defender lines of communication were not impeded at all. Taking the Soviet and U.S. models of attack doctrine, one can evaluate to what extent each has been applied and with what degree of success. What might be called "U.S. doctrine" has been applied in six cases in the 1945-1967 period and four cases between 1968 and 1982. "Soviet doctrine" more nearly resembles the approach used in two cases in the early period, and seven more recent experiences. The results are indicated below and in greater detail in Table B17.

	"U.S. Approach"	"Soviet Approach"	Other
Attacker Win	8	8	0
Defender Win	1	1	3
Draw	1	0	0

One can also subdivide the elements of the attack as follows:

Outcome	Intensive Preparatory Fires	Intensive Assault	Systematic Clearing	Initially Seize Key Objectives Only
Attacker Win	7	10	10	8
Defender Win	2	0	0	2
Draw	0	0	0	1

The defender also has several tactical options. One way of categorizing these options may be defense in depth, key sector defense, and mobile defense. For these purposes, defense in depth suggests an outer and inner defense combination; key sector defense means strongpoint defense of vital positions especially those controlling major avenues of approach; and mobile defense is based on counterattacks. These are not mutually exclusive options.

In our cases, defense in depth was employed in 13 instances, key sector defense in 16 battles, and specifically major defensive positions along avenues of approach in 15 cases, and a mobile defense in 7 battles. It is not really possible to draw conclusions about effectiveness of different defensive schemes, since most cases are a combination of techniques. Although mobile defense was least common, its success rate was highest by far (43 percent). However, a mobile defense usually presupposes a relatively favorable (to the defender) force ratio which in fact did apply in most cases.

The most common defensive concept was defense of key objectives with defenses established on avenues of approach into the built-up area. Most "key objectives" were buildings or important intersections. Although key buildings themselves were the focal point of combat only about half the time, significant combat near or around such structures took place in almost every battle (85 percent of the cases). In most cases (90 percent) defensive positions consisted of several positions around or abutting a strong central building. In about the same frequency of cases major defensive positions emerged at key bridges or important intersections in order to obstruct movement. Strongpoints were typically attacked with heavy weapons when available, and these positions usually fell. However, if systematic shelling by direct-fire support weapons failed, attackers usually attempted to outflank the strongpoint. In several cases, particularly where the force ratio heavily favored the attacker, the latter simply continued to direct intensive firepower at the defensive position until it was reduced. Without heavy weapon support unsuccessful attacks on such positions were common.

Most accounts do not give adequate detail to compare building-clearing techniques. Techniques differ widely and many types of buildings and equipment come into play. In almost half of the battles studied, defender reentry into cleared buildings was a problem. In only three battles did this phenomenon not take place, and these were primarily artillery sieges. (Its prevalence among other cases is unclear.) In larger cities defenders habitually re-entered "cleared buildings."

In several cases the attacker bypassed defensive strongpoints. Generally this proved wise as the cost in time, casualties, and resources was rarely adversely affected. In only two cases was the casualty cost of bypassing resistance high--Aachen and Suez City. Additionally, in Manila bypassing was practiced, but not recommended for future operations unless follow-on forces were immediately committed to seize the bypassed terrain. In this instance, the forces needed to contain a bypassed enemy were considered to be more of a drain on the attacker's strength than the casualty costs of actually eliminating the enemy by assault.

## ARMOR

It has long been thought by many that armor has little role in built-up areas. This conclusion is not borne out by the present study, although the role of armor in static defense may be quite limited. In offensive operations armor often assumed an important, and at times vital, role. In three-fourths of the cases, organic tank support was a central element when special assault teams were employed. Overall, the use of armor in special assault units had a greater association with successful outcomes than has employment of such teams without tanks.

Most combat in cities involves tanks, if the sample is at all representative. Indeed, every attacker had at least some armor, and most defenders (about 75 percent) had at least some tank support. Only in Zahle did the eventual winner not have tank support, and Zahle was primarily a siege case.

From 1945 to 1967, armor was ranked as a (or the) decisive factor in over one-half the cases studied. By contrast, after 1967 armor was indicated as the (or a) principal factor in outcome in only one of thirteen incidents. It is possible that the proliferation of man-portable antitank guided missiles (ATGMs) and rocket launchers has made tanks more vulnerable and, hence, reduced their effectiveness in urban combat. The relatively lessened intensity of urban combat is another factor that accounts for the reduced influence of the tank since 1967. The principal role of the tank in urban combat is to act as an "assault gun" providing fire support to the infantry. Despite acknowledged vulnerability in World War II, tanks were committed to deliver concentrated, sustained fires to reduce stubbornly-held strongpoints. In more recent battles the defenders have not contested single structures on the scale seen in battles like Stalingrad, Aachen, and Manila. The notable exceptions are the defenses within the citadels at Hue and Quang Tri II (and tanks proved valuable at Hue, while research for this study does not indicate if tanks were even available at Quang Tri II.) Battles since 1967 offer fewer instances where the degree of resistance justified risking tanks to eliminate single strongpoints when lesser means have sufficed.

Finally, the degree to which a tank or any other weapons will influence a battle is dependent on the user's tactics. All nine battles prior to 1967 involved attackers with experience in the use of armor in conjunction with infantry. In contrast, only four of thirteen battles since 1967 involved an attacker (i.e., Israel) with extensive experience in coordinating infantry-armor operations.

## ARTILLERY

The role of artillery in MOUT has also often been considered as limited. However, artillery has played an important role in a number of major urban conflicts, and was judged a (or the) decisive element in four of the nine battles between 1945 and 1967. There was a sharp drop in the judged value of artillery role in the later period during which artillery was not seen as the critical element in any battle. Even in this period, artillery played an important role in several engagements, for example, Hue, and Quang Tri II in Vietnam.

The hypotheses addressed here consider several points regarding artillery. Among the issues are statements about disruption capacity, rubble, use of self-propelled artillery, comparative value of direct and indirect fire, fuzing, use of AAA (antiaircraft artillery), use of mortars, and methods of protection against artillery fire.

Artillery employed in indirect fire was only moderately effective in disrupting defenders, 50 percent of the cases being judged as "significantly" disruptive. This percentage remains fairly constant, both over time and across attacker and defender wins. The rubble resulting from artillery fired in an indirect fire is also known to have created considerable problems for the attacker in several famous battles of World War II, notably Aachen and Stalingrad. Yet, indirect fire artillery was not seen to complicate house-clearing in about two-thirds of the cases in World War II, but may have been perceived as a problem in two of three cases after 1967.

The formation of special teams is a common feature of urban combat. In most cases, these assault teams have had organic armor or SP artillery. However, tanks have been several times more common than artillery in this role.

U.S. and Soviet doctrine recognize the value of SP artillery in a modern city environment. In the war in Lebanon in 1982, the IDF made limited, but especially effective use of 155mm SP howitzers. These were allegedly armed with special "demolition" shells for use against structures. These weapons were reported to have "brought down" 7-8 story structures with two, or at most three, carefully aimed shells.

Automatic antiaircraft guns were found to be extremely useful in some battles. AAA was used only rarely in World War II, and then generally against assaulting personnel rather than against structures. It has been used more frequently in recent cases, but against buildings rather than people. The high rates of fire of modern AAA make it an excellent weapon in terms of shock and destructive potential. However, supply can be a problem since the volume of fire exacts a high toll in ammunition. The utility of AAA in cities is recognized today by many who have fought in these conflicts. General Ngo Quang Truong, one of South Vietnam's outstanding military leaders, indicated that the anti-structure use of AAA was well known to him and several others. However, ARVN units did not face an air threat and generally had no organic AAA. In both Quang Tri II and Hue, where Truong was in leadership roles, he felt AAA would have been a considerable asset.

Mortars are probably more heavily used than any other single category of artillery weapon. The most common and valuable urban use for mortars is harassment and interdiction fires. Mortars below 160 mm (which covers all but a few freak weapons) are not particularly effective for cratering roads or for penetrating well-built structures.

One of the greatest contributions of artillery across all cases was interdicting supplies, evacuation, and reinforcement in the enemy rear just outside built-up areas. Artillery bombardment per se, that is, an indirect artillery siege, was neither efficient nor effective. Heavy shelling in and of itself does not do as much damage to well-constructed buildings as is widely believed. In four of the five defender wins, the attacker had a

clear superiority in artillery. In all defender wins and in the single draw the attacker had at least some artillery support. Moreover, there are several indications that heavy artillery shelling did not significantly undermine defender morale except when combined with other factors. In specific uses such as interdiction, harassment, and in certain direct-fire roles, artillery has shown itself to be a uniquely formidable asset in cities.

Artillery was seen as a (or the) critical factor in outcome in only four (18 percent) of the battles. All of the battles in which artillery was deemed critical were World War II era engagements, and thus "unlimited." It is also likely that overall quantity of artillery brought to bear against cities was more intensive in World War II simply because the combatants had more of it.

#### AIR POWER

Overall, air power was estimated to be a (or the) critical factor in outcome in eight instances (36 percent). This is more frequently than armor or artillery and includes over half of the 1942-1967 battles studied. However, air superiority rested with the attacker in two of the five defender wins! Like both armor and artillery, air power was deemed a critical factor more frequently in the earlier period. The drop in the post-1967 cases may be partly attributable to the fact that air power was avoided in three of those battles, and was only marginally applied in two others--all for political reasons.

Air power played an important role in interdicting supplies, evacuation, and reinforcement just outside the built-up area in well over one-half (13, or 59 percent) the incidents. This is a singularly high figure when it is recalled that air power was not even brought into play in several recent cases. The interdiction mission was important in both attacker and defender wins and in older and newer battles alike.

Another mission assigned to the air arm is bombardment. Bombardment usually is intended to reduce both the defenders' will to resist and their physical capabilities. Air power was seen empirically as 'relatively ineffective in both respects. In the majority of both attacker-won cases and battles in which the defender won, aerial bombing did not erode the defenders' will to resist. Nor did it significantly erode defender military capabilities. However, air attack did reduce both defenders' morale and capability much more frequently in post-1968 cases. This may be explained by the fact that all the incidents involving such success involve irregulars. It may be concluded that irregular forces are more often cowed by air power. Their organization and discipline are probably too fragile. Furthermore, the use of air power by the other side may suggest to them consciously or subconsciously that the contest is "out of their league" or that the adversary has decided to disregard public opinion or other constraints.

One tactic for protection against both air and artillery used by both attackers and defenders was to keep their troops close to the enemy forces in order to deter enemy air or artillery support. This "hugging" tactic, whether by design or by a consequence of close combat, seems to have been used in over one-third of the cases. In those instances the tactic appeared to have at least some effectiveness most of the time.

In the modern environment, aircraft can perform more responsive and accurate close air support (CAS) than was possible in War World II. True CAS can be difficult on the open battlefield, and urban terrain complicates the task. The advent of rotary-wing aircraft (helicopters) as gunships may have brought some fundamental changes to modern warfare. The helicopter may be too vulnerable, but recent experience in Vietnam and the Middle East suggests otherwise. Israeli gunships operated on the outskirts of the built-up areas with impunity, and medical evacuation also proceeded swiftly and efficiently with helicopter support.

The Israelis in Beirut employed pinpoint bombing by fixed-wing aircraft using cluster bomb units (CBUs) and smart bombs, as well as phosphorous and other munitions. Israeli intelligence had an outstanding ability to locate PLO facilities and designate targets by virtue of detailed aerial photo maps. This intelligence, combined with the quality of IAF (Israeli Air Force) pilots and sophistication of their aircraft, made these attacks feasible. Collateral damage to structures outside intended target areas was very scant. Political and human costs resulted when faulty CBUs failed to detonate after impact, causing casualties later among children and other unintended victims. Such an eventuality would probably not be an issue in a general war, but could create very serious political repercussions in any limited conflict in which the United States might be involved.

#### OUTCOME

The clear conclusion from the 22 cases selected is that the attacker will usually succeed in capturing the city he attacks. Irrespective of specific attributes such as force ratio, armor superiority, or even control of the air, the attacker is able to concentrate his forces and is generally assaulting a foe that is at least partially isolated. If his planners did not believe they could win, the attacker would avoid the attack or create a change in circumstances that would alter the odds to the attacker's favor.

The fact that the attacker did not win over one-quarter of the cases may in fact be startling. However, of the 5 defender wins and 1 draw, 2 situations (Ashrafiyeh, Zahle) were little more than artillery sieges, and the draw (Beirut I) was limited to largely irregular forces on both sides. Two other defeats stemmed from fundamentally poor intelligence, among other things. Sound intelligence would have led to either the avoidance of a battle (Suez City, possibly Arnhem) or a different approach (possibly Arnhem).

The series of hypotheses that appears most clearly to parallel outcome concerns exploitation of urban terrain and municipal power and other city services or utilities. That this set of hypotheses should be the most closely related to success probably reflects the importance of planning and intelligence.

Although the defender is expected to have a planning advantage in terms of his knowledge of the city and therefore his ability to use its features this expectation is occasionally invalid. The defender has often been an alien. In either case, a sound defensive plan, based on knowledge of terrain, is required to counter the usually superior attacking force.

No single set of force balance factors so closely parallels win/loss profiles as use of urban terrain does. This fact must be added to previous considerations and to the disastrous effect of significantly erroneous intelligence in Arnhem, Ortona, and Suez City, among others. (For the defender, the same observation is true in respect of Quang Tri I, Sidon, Tyre, and other cases.) The attacker and defender require realistic planning to optimize or overcome the characteristics of urban terrain. In the three most recent cases, (i.e., in Lebanon) for example, the defender made very little use of the cityscape in a defense that was, consequently, quite ineffectual. The IDF was surprised the PLO did not exploit the terrain. The PLO generally lacked a coherent plan of defense. Positions were not well sited for mutual support, fire planning was not coordinated, and obstacles were easily breached or avoided.

Battle data does not make a very persuasive case for the importance of air superiority alone. While it is true that attackers won 84 percent of the battles in which they enjoyed air superiority, they also won both battles in which the defender had air supremacy, (i.e., Vietnam). In fact, in spite of the skeptics regarding the use of armor in cities, the armor-superior attacker won 79 percent, and the armor-inferior attacker (i.e., attacker in cases in which the defender had armor superiority) did not win. Artillery data are similar. The artillery-superior attacker won 78 percent, while the artillery-superior defender won the only engagement in which this situation occurred. (In this case, Arnhem, it was the German "defenders" who counterattacked to eliminate the British "attackers" who in turn were defending the airhead they had initially siezed.)

Force ratios belie the suggestion that the attacker must have a substantial manpower advantage. When the attacker enjoyed a 4:1 superiority or more he won 71 percent of the engagements. This was about the same as the outcome in cases of 2:1 or better ratio (79 percent). Below a 2:1 ratio, a drop-off in effectiveness is suggested, but not to a significant degree (63 percent).

As we have suggested, isolating the defense is apparently very effective. The attacker won all four cases in which the defense was totally isolated. Even partial cut-off of the defenders resulted in attackers enjoying a success rate of 80 percent. Conversely, attackers won only 50 percent of the battles in which defenders were not significantly cut off. No single variable appears more consistent than isolation.

Outcomes were also considered when attacker casualties were unacceptable, that is, when the offense was particularly sensitive to casualties among its personnel. Some have suggested that an attacker's unwillingness to accept relatively heavy casualties might seriously impair his ability to fight in cities. The data suggest this hypothesis may have some validity, as attackers won only 55 percent of such engagements. Tables B8a to B8g indicate that no combination of superior forces materially enhances attacker win rates, but unacceptability of casualties appears to reduce the attacker's ability to win.

Another hypothesis concerning defender identity may also be supported by the data. There has been some suggestion that familiarity with the city under attack will benefit the defenders. If this is true then native attackers should do better and alien defenders worse than would otherwise be expected. The Battles Profile table on page 94 shows that alien defenders in fact won only one of nine engagements. Native attackers were involved in relatively few battles. Although they were undefeated, their presence cannot be considered as decisive. In these instances (e.g., Jerusalem, Hue) local native attackers were incorporated in an attack dominated by aliens.

There is little predictive correlation between the outcome of a single battle and the outcome of the war of which it is a part. It is, however, reasonable to investigate the outcome of a battle on the basis that the attacker or defender may be unevenly aided by the parameters of the conflict.

Specifically, how does limited war, as opposed to unlimited war, affect outcome? Unlimited war is defined for these purposes as a conflict in which the attacker perceives or responds to no political or other external constraints except those necessitated by the tactical and strategic military equation. There are of course no purely unlimited wars, since all wars are fought for political, economic, or social reasons which constrain military actions to some degree. At the same time an empirical study has little difficulty in distinguishing in most cases between wars that can be considered limited and those that cannot.

All World War II cases were seen as unlimited. The same was true for most other actions. Cases like that of Seoul, where the war was limited, but the combat for Seoul was not, are unlimited for the purposes of this study. Indeed, the only difficult case is Beirut II where a persuasive argument could be made for classifying it either way. In this case political constraints heavily impinged on military action, but the military action was still extensive. For this study, Beirut II is considered "unlimited." Even if it were alternately considered as "limited," it would not significantly alter the data trends that suggest that the attacker is in a much stronger position in an unlimited war. In limited war one must seriously question the wisdom of assaulting built-up areas. Table B10a indicates that the attacker won only two of five such engagements (three of six if Beirut II is to be included). Given the prevalence of limited city battles in the post-1968 period (see Table B10b), this observation is especially salient.

Combat duration is another key feature of urban combat. It would be senseless to create a timetable or "average" duration, especially since city size varies as do all the other variables discussed earlier. It is noteworthy that over three-quarters of the engagements lasted 6 or more days, over one-half more than 2 weeks. Indeed, engagements lasting 5 days or less were fewer than those consuming more than 30 days! The only two city battles lasting less than 48 hours involved extremely lopsided force ratios. In the case of Ban Me Thuot, a town of perhaps 150,000 people, approximately 30,000 NVA troops attacked about 4,000 ARVN by surprise. In that of Suez City, almost depopulated, fewer than 500 Israelis attacked some thousands of Egyptian Army troops and city reserves well integrated into a sort of para-military militia. Two of the other three battles lasting fewer than 6 days also pitted hopelessly outnumbered, under-equipped, and totally cut-off alien irregulars against a first-class military machine. Such situations may face the United States as well, but if the situations diverge from these one-sided affairs, U.S. planners should probably count on a more extended duration for city fighting.

Urban warfare, especially in large cities and involving regular or quasi-regular forces, is time-consuming. Only two urban battles in cities of over 100,000 civilian population ended in less than 48 hours. The only two city engagements between regular armies lasting less than a week were Ban Me Thuot and Jerusalem. In fact, these engagements and Seoul were the only battles between regular forces in large cities (of nine in our population) that required less than 2 weeks. The data suggest that most city battles are decided by the end of the month (68 percent) and these are won by the attacker (87 percent). However, the attacker success rate seems to plummet quickly after 1 month. In this group of 22 battles the attacker won only 43 percent of those lasting over one month. Tables B13 through B16 further illustrate these points.

## IV

### FINDINGS AND CONCLUSIONS

It can be misleading to attach a great deal of emphasis to a study case population which is too small to generate incontrovertibly reliable data. The size of the population, however, was dictated by the desire to compare World War II battles with more recent major engagements (of which there is a limited number). A key value of the research lies with this comparison.

The results of the cases studied suggest that current doctrine is well founded in advising attacking American forces to avoid cities where this is feasible. However, the data also suggest that a well-conceived attack on urban terrain will be successful and may not be overly expensive in casualties or resources. The result depends upon a number of factors, several of which are not under attacker control. What the city does consume in almost every case is time. Isolating and encircling the city may at least prevent the prolonged battle for control of the city from slowing the overall offensive. Moreover, in cases where attackers enjoyed a 4:1 advantage or greater in personnel, even major cities did not consume more than 2 weeks' time on the average.

Whether the attacker needs to allocate personnel at anything like the rates of 4 (attacker):1 (defender) is not at all clear. The required size of the attacking forces is dependent on the quality of intelligence, the degree of surprise, and the degree of superior firepower (air, armor, artillery) the attacker can achieve versus the degree of sophistication with which the defender has prepared the city. Also important is whether the defender is alien from the local population, is wholly or partially cut off from external support, and has effective communications systems. Defense in a built-up area does not appear to constitute a better risk than defense in other terrain in terms of ultimately holding the ground. However, defense of cities, especially large cities that an attacker cannot avoid, does appear to place unique advantages in the hands of the defender. A well-planned defense even if cut off, or lacking in air, armor, or artillery weapons, can consume inordinate amounts of the attacker's time. This time can permit the defender to reorganize, redeploy, or otherwise more effectively marshal resources in other areas. The use of a city battle, even a certain defeat, to turn the tide of the overall strategic situation occurred (though unintentionally) at Khorramshahr. Stalingrad also served to turn the tide once the strategic opportunity was recognized.

Another defender consideration has to do with resource options. The defender must decide whether to defend a city, how to defend it, and the magnitude of the resources to be allocated to the effort. Data from this study indicates that defensive tactics must be determined by the particular circumstances such as city size,  $C^3$ , street pattern, and structure composition, etc. It does not appear that any of the three defensive

concepts (defense in depth, key sector defense, mobile defense) is inherently better or worse than the others. (The success rate of the mobile defense is a result of the favorable force ratios needed to conduct it and not due to any intrinsic value.)

Another consideration for both attacker and defender is the relationship between force ratio and combat duration (Tables B19b and B19c). This relationship is simply that as force ratio increases in favor of the attacker, combat duration decreases. This relationship is consistent except, surprisingly, in situations in which the attacker has a less than 1.5:1 advantage. In this latter instance, combat duration is less than battles where the attacker has a force advantage of up to 3:1. The reason for this inconsistency is easily explained. The attacker will generally attack only if reasonably assured of victory. The decision to attack a city, despite lacking a significant numerical superiority, presupposes in attacker's estimate of favorable conditions that far outweigh mere numbers.

At the other extreme of force ratios, i.e., an attacker advantage of 4:1 or greater, numbers alone favor the attacker's victory in a relatively short time. However, most combat falls between the extreme of victory by overwhelming numbers or a coup by a significantly smaller force. In most cases, the attacker estimates he cannot achieve a coup with small forces and strives for superiority. If unable to attain an overwhelming force ( $\geq 4:1$ ), the attacker still resorts to an attack that, although probably successful, will be of relatively long combat duration.

Table B19c shows similar relationships between force ratio and combat duration. In this table siege battles have not been included, as the attacker was unwilling to risk an all-out effort to seize the city. As might be expected the average combat duration decreases. However, the relationships between each of the three-force ratio categories remain the same, that is, the greatest attacker: defender force ratio ( $\geq 4:1$ ) still consumes the least time, and the lowest ratio ( $< 1.5:1$ ) consumes less time than the middle range of force ratios ( $\geq 1.5:1 \leq 3:1$ ).

Despite the relationship between force ratio and combat duration, preparation of the city for defense can offset some of the defender's force ratio disadvantage. If the force ratio is less than 4:1 in favor of the attacker, careful planning, and construction of defensive positions, kill zones, and obstacles can extend urban combat for several weeks in a major city. In fact, most city battles are not characterized by force ratios of 4:1 or greater. The mean force ratio of our 22 cases was 3.5:1 but this is misleading because the mean for 19 cases was 2.3:1. Three cases were partially lopsided and accounted for the difference. Where two regular armies confronted each other, 86 percent of the cases were characterized by an attacker advantage of 3:1 or less. Defensive forces in large cities can put up stiff resistance under these circumstances without reinforcement especially if the defense of the city has been prepared for in advance.

Superiority in specific combat forces does not seem to be significantly related to successful outcome. From the attacker's point of view, air and armor superiority appear to be of roughly equal weight, but have very different implications. Control of the air is important for protection of attacking forces more than for the destructive power that can be unleashed through air attacks. A second important role of air power is to cut off the city from sources of supply, reinforcement, and evacuation. The historical debate over the utility of area bombing of a city cannot be definitively resolved from a population of only 22 cases. It appears that the psychological utility of bombing can be great depending upon the character of the defending forces and their perceptions and expectations. The psychological effects of aerial bombardment appear to increase to the degree that the defenders are surprised by an unanticipated attack, or inexperienced, or inadequately trained or organized. Air attack is further demoralizing to defenders who initially hold high expectations of victory.

Armor is similar to air power in terms of these conclusions. There has been a growing belief that armor has no role in city fighting. These cases show that the role of attacking armor is important, particularly at the outer perimeter in operations to isolate a city. The defender may also use tanks on the outer perimeter to delay or prevent isolation. The defender, however, will probably place greater emphasis on the antitank (AT) missile. Tanks and armored personnel carriers (APCs) have also proven vital to the attacker inside the city as long as they were protected by infantry. Many cases in World War II and the IDF experience in the 1982 battles in Lebanon illustrate very clearly that armor can be invaluable in cities. U.S. experience in Hue also demonstrated the key role armor can play.

Artillery, like armor, has two distinct roles: outside the built-up area to isolate or prevent isolation, and within to provide direct-fire support. New tactics and equipment emphasizing the use of heavy SP artillery in the direct-fire role (not in itself a new tactic) undergird the special value of artillery in cities. By contrast, indirect fire support is a more problematical asset. It is apparent that indirect artillery fire must be concentrated in volume against a small target area to be truly effective. Even so, indirect artillery fire, like air attack, is significant for its psychological impact.

In these 22 cases the application of air, armor, and artillery systems in a city has not been systematically or consistently exploited from 1942 to the present. IDF operations in 1982 were extremely efficient and came closest to a model for the integration of combat arms in military operations in and around built-up areas. However, the PLO's meager defensive capabilities, poor planning, and unrealistic "military" thinking must be taken into account in assessing the value of these experiences.

One of the factors that facilitated IDF military success in 1982 was the determination of the IDF senior command. It was on the basis of this

determination that the IDF fought a full-scale war against a foe geared up only for limited war. General or relatively unlimited wars are the only situations in which the attacker has extremely favorable advantages over the defender in MOUT. It is recommended that unless the attacker has a relatively free hand he should not consider attacking a built-up area. If the attacker is constrained the defender must be considered to have an equal chance to win or at least raise the attacker's cost of victory, regardless of force ratios. These constraints might include the following:

1. Limiting friendly casualties
2. Minimizing civilian casualties and/or collateral destruction to
  - a. Avoid alienation of the local population.
  - b. Reduce the risk of adverse world or domestic opinion.
  - c. Preserve facilities for future use.

Data from the 22 cases is not compelling that new weapons have significantly affected the course of combat. It appears that tanks, whose vulnerability in cities was evident even in World War II, are today more vulnerable to a wider range of better AT munitions. At the same time evolution and proliferation of new tank weapons and ammunition give armor more destructive firepower. There is also some evidence that the newest families of air-to-ground munitions may be giving the air arm a viable tactical role in MOUT, although it is too early to render any verdict. In an unlimited war environment, the attacker may have gained a slight edge, but in a limited war it appears the defender has gained.

What remains the same is the priority for both attacker and defender to control military operations in highly decentralized circumstances. Personnel training and motivation continue to be at least as important as equipment or force balance factors.

Equally important is the requirement for truly combined arms operations, especially for the attacker. The infantry has long been thought to be the primary combat arms branch in city fighting. Certainly, it is true that the foot soldier's role is unique and somewhat different in urban areas, but so are those of armor and artillery. Moreover, several of our cases (Suez City is only the most obvious) reaffirm the necessity for the various branches to plan, train, and develop doctrine together. Infantry requires fire support against strongpoints no more or less than armor and SP artillery must be protected by infantry.

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APPENDIX A  
BATTLE SUMMARIES

## BATTLE SUMMARIES

### AACHEN

The battle for Aachen, Germany, developed during the U.S. First Army offensive to breach the West Wall fortifications in the fall of 1944. A VII Corps reconnaissance in force began in mid-September, but operations in Holland prevented support for a major attack until October. This lull permitted the Germans to reinforce the West Wall in the Aachen sector. A rapid thrust bypassing the city was no longer possible.

Aachen, as the ancient capital of Charlemagne, had a symbolic significance to the Germans. Furthermore, it was the first city on German soil to face an assault by the Allies. Since Aachen had been bombed 75 times during the war, many of its buildings were already destroyed and its pre-war population of 162,000 reduced to 25,000. Defending the city was a mixed force of 2,000 men, 5 tanks, 6 150mm and 19 105mm howitzers, and 8 75mm AT guns.

XIX Corps began its attack north of the city on October 2, followed by VII Corps attacking in the south on October 5. Both forces fought a series of battles to penetrate the fortified zone and gradually encircle the city. The Germans launched several unsuccessful major counterattacks during this period.

By October 10, Aachen was encircled on three sides and under artillery bombardment. U.S. forces issued an ultimatum to surrender within 24 hours. No reply was received. On October 11, the 1st Division (VII Corps) began an assault to completely cut off the city. Intense fighter-bomber and artillery fires preceded the attack. Five thousand shells weighing 169 tons were expended on this first day alone. Extensive shelling and bombing were to characterize the remainder of the battle.

On October 16, 1st Division patrols made contact with those of the 30th Division (XIX Corps) and Aachen was finally surrounded. The attack into the inner city was delayed while additional forces were deployed to block any German relief attempt. On October 18, a reinforcing task force of the 3rd Armored Division was attached to the 26th Regiment, 1st Division, for the final assault on the inner city. Two infantry battalions, reinforced with armor, advanced westward in a two-pronged attack. The northern battalion was to clear the main strongpoints on dominating hills within the city, while the southern battalion advanced on a railway axis to cut the city in half. Achievement of these objectives would simplify the task of isolating and mopping up any remaining resistance.

The attacker's progress was slow in the building-to-building combat. Extensive rubble impeded movement and provided excellent defensive positions. Bitter experience quickly taught the Americans that each cellar had to be cleared prior to continuing the advance. Similarly, sewers had

to be blocked to prevent Germans from infiltrating and firing from the rear. One battalion developed a checkpoint system of marking its progress to ensure each area was completely cleared before continuing the attack. Tanks or tank destroyers were attached to each platoon to provide supporting fire against strongpoints. The tanks often used cleared side streets for protection, emerging only to fire and then returning to cover or moving to a newly cleared side street. One battalion similarly employed two 155mm self-propelled guns in direct fire against the solidly constructed buildings of the city. Large quantities of explosives were used as the infantry moved from building to building through "mouseholes" blasted in the walls, thereby avoiding the streets. Flamethrowers also proved useful in inducing the surrender of defenders trapped in buildings.

On October 21, the German commander surrendered the city after his command post came under the fire of the 155mm guns. Aachen had been virtually destroyed.

#### ARNHEM

On September 17, 1944, Market-Garden, the largest airborne operation in history, was launched in the Netherlands. The overall plan was to land three airborne divisions to seize key bridges in a 100 kilometer-long corridor through which ground forces would pass as the first step in a decisive final offensive into Germany. The British 1st Airborne Division was given the mission of seizing the Lower Rhine bridges at Arnhem at the farthest end of the corridor.

The division consisted of two parachute brigades and one glider-borne air landing brigade totaling 10,095 men. Additionally, a Polish parachute brigade was attached as a reserve force scheduled to arrive two days later. Twenty-four 75mm pack howitzers formed the only supporting artillery.

Initially opposing the 1st Airborne Division was an ad hoc force of German units only recently formed from training establishments, garrison personnel, and the hastily collected remnants of troops from all services that had been retreating from France. The core of this mixed force was a 450-man SS training battalion of enthusiastic, but unskilled recruits. Additionally, and most importantly, two decimated, but veteran SS armored divisions were refitting near Arnhem after being battered in the Normandy fighting. The presence of these divisions came as a surprise to the British. The 9th SS Panzer Division, with a strength of 3,500 men and 15 tanks as well as half tracks, armored cars and artillery, was to be the critical defender of the city. (The 5,000-man 10th SS Panzer Division was immediately deployed south to Nijmegen and did not participate in strength in the fighting in the city). Altogether the German forces at Arnhem initially numbered about 6,000 men. The Germans were reinforced daily with men, tanks, and artillery as the fighting developed. Even the Luftwaffe was able to appear in force, a rare occurrence on the Western front. German fighter aircraft increasingly strafed British positions as the battle progressed.

Hasty planning and faulty intelligence led to dropping the 1st Airborne Division 11 kilometers from its bridge objectives. Shortage of aircraft permitted landing only about half of the division on September 17. As a result, the 1st Air Landing Brigade was assigned to secure the drop and glider landing zones for the arrival of the remainder of the division on the following day. This left only the 2,000 troops of the 1st Parachute Brigade to move and take the bridges.

Two of the three battalions of the 1st Parachute Brigade were halted by stiffening German resistance from the SS training battalion and elements of the 9th SS Panzer Division. The latter included small detachments of armor. The British lacked heavy weapons to deal with this threat, having only a few 6 pdr (57mm) AT guns. The 2d Battalion along with elements of other units did manage to seize the northern end of the highway bridge objective. By morning, about 750 paratroopers and a few 6 pdr AT guns had succeeded in infiltrating to the bridge position. Here they established themselves in 18 buildings near the bridge. These buildings mainly overlooked the earth ramp that raised the road to the high bridge spans. Most had cellars which were used as aid stations and shelters during shelling. The next morning two attempts to capture the German held southern end of the bridge failed in the face of 20mm flak guns positioned to fire down the roadway.

The battle for the bridge lasted the next 4 days. The Germans made several attempts to retake the bridge with attacks from either end. In one instance a squadron of the 9th SS reconnaissance battalion attempted to force its way across the bridge from the southern side to rejoin its division. Five armored cars and six half-tracks were destroyed by the British 6 pdrs, PIAT (Projector, Infantry, Antitank) launchers, and grenades thrown down from windows above the bridge.

Later a battle group of the 9th SS began a series of infantry attacks supported by the long range fire of a small number of tanks and assault guns. The British repelled these assaults, often abandoning a building during the shelling only to retake it by counterattack. Several buildings burned out of control, compounding the defenders' problems. On September 19, four tanks drove up the bridge ramp and began to methodically fire down into the buildings. German infantry closed in under this fire. By night-fall enough buildings had been cleared to permit the German to cross armored vehicles on the bridge, although the defenders could still deny passage to soft-skinned vehicles.

On September 20, the Germans began their final assault. Five tanks and an assault gun fired into the upper stories of the few remaining buildings. German infantry blew "mouseholes" into the walls of the ground floors. Grenades were then thrown into the breach and a three- or four-member assault team entered firing submachineguns. The British, however, countered this tactic by constructing shelters of rubble and fallen beams within the building. The fighting, therefore, continued within the interior of the building. The Germans gradually proceeded as two of the tanks kept pace with the advance, firing from the street into doors and windows. When a second German force captured 40 survivors attempting to escape, the battle for the bridge ended.

Meanwhile the majority of the division was fighting a battle for survival in the villages and woods west of Arnhem. They had been beset by difficulties from the beginning. The Germans had captured the plans for the entire Market-Garden operation which simplified their deployment of forces. British units were frequently out of communications because their radios did not have the range or power to operate effectively among the trees and buildings. The division commander was cut off for an entire day while making a personal reconnaissance necessitated by the poor communications. Likewise, the paratroopers did not have radio contact with the ground forces of XXX Corps struggling up "Hell's Highway" towards Arnhem. When the 4th Parachute Brigade arrived on September 18, it suffered casualties from German antiaircraft and small arms fire positioned to cover the drop zone. The brigade was subsequently cut off and mauled in the effort to link up with the remainder of the division. All attempts to attack through to reach the battalion at the bridge were repelled with heavy casualties.

Overwhelming Allied air support, normally characteristic of operations in Europe, was critically needed, but never arrived. The division had been given a supporting RAF (Royal Air Force) fighter-bomber group, but fog over its airfields in England hindered take-offs. Additionally, the division's ground-to-air communications failed, leaving no means to call or direct strikes. Finally, divisions of command responsibility for air operations resulted in the RAF planes being denied use of the airspace over the battlefield when U.S. fighters were providing escort to the transport aircraft.

Increasing German pressure squeezed the division into a perimeter around the town of Oosterbeek about five kilometers west of the bridge. Inability to communicate with the advancing ground forces led to the air dropping of badly needed supplies into German hands.

Weather delayed the arrival of the majority of the Polish brigade until September 21. Landing south of the river, the Poles suffered heavy casualties and were halted in subsequent attempts to cross the river to reinforce the British. On the same day, however, radio contact was established with XXX Corps which was now close enough to provide long range artillery support to the paratroops. German counterattacks south of the river, however, prevented a link-up with the corps. For 4 more days the division resisted German attacks on the perimeter. German assault teams with tanks and assault guns supported by artillery reduced the defenses house by house. Flamethrowers were also used with great effect.

On the night of September 25, the survivors evacuated the perimeter and crossed the river. The 1st Airborne Division had been expected to hold 2-4 days. They had lasted for nine. Only 2,163 of the original 10,095 men of the division got across, although small groups evaded the Germans and came out later.

## ASHRAFIYEH

In 1978, Syrian forces in Lebanon faced a complex political situation in which the power of the Christian militias was seen as a clear threat to stability. Syria now chose military action against the Christians, just as it had earlier acted against the Muslim/leftist forces. In an attempt to weaken the Christians by an attack on their center of power, the Syrians laid siege to the Christian stronghold of East Beirut (Ashrafiyeh). The siege began on July 1, and lasted until October 8, although heavy fighting occurred only during the first week of each of these months.

The Syrians were intent on accomplishing their mission with minimum losses and therefore relied almost entirely on artillery bombardment to break the defenders. On July 1, 15,000-20,000 Syrian troops encircled the Christian area of Beirut and its suburbs. First isolating a selected suburb, Syrian forces then pounded the area for 5 hours using artillery, multiple rocket launchers, mortars, and tanks. No direct assault into the suburb was attempted. Lebanese casualties were 35 killed and 88 wounded, mostly civilians. Shelling of the city itself began the following day.

For 4 days the Syrians fired 250-500 metric tons of ammunition daily on East Beirut. Despite the intensity of the bombardment, damage and casualties were far less than might be expected. The Syrians were incapable of accurately directing their fires and their failure to use delayed fuzing generally limited damage to the upper floors of buildings. The Christians' use of tunnels and shelters minimized casualties. Nevertheless, 160 Lebanese were killed and 500 wounded; again mostly civilians. The fighting stopped on July 6, after the Syrian-backed Lebanese president threatened to resign. Israeli jets buzzed Beirut on the same day as a warning to the Syrians.

Beirut was relatively calm throughout July with the exception of shelling on the 23rd and 24th in retaliation for the sniping deaths of two Syrian soldiers. Throughout August, Syrian troops occasionally clashed with Christian militiamen, or shelled selected neighborhoods, but most of the Beirut fighting was skirmishes between factions within the city. The Syrians also conducted operations to disarm militiamen in the mountains north of the city as well as to completely cut supply lines to East Beirut. During the first weeks of September, the Syrians toned down operations as they awaited the outcome of the Camp David negotiations. The results of the Camp David agreements contained no pleasant surprises for the Syrians. Within 2 weeks of the announcements, open combat again erupted.

On September 30, the heaviest fighting of the Lebanese conflict broke out as Syrian forces moved to seize two bridges in the north of the city and a suburb district in the south. Heavy shelling of targets throughout East Beirut was resumed. The Syrians began using Soviet-built 240mm mortars for the first time and found them quite effective. (Despite the failure to use a fuze delay, the steep trajectory of the 240mm round enabled penetration of the top two or three floors of a building while its explosive power tore craters several feet deep in the streets.) A cease fire was called, but fighting was renewed the following day. The Syrians

succeeded in taking the bridges which were necessary for the ease of Christian resupply efforts. Efforts to seize the suburb, however, were defeated by defenders who employed several innovative weapons. (French Sneg air-to-ground rockets on homemade ground mounts were used as antitank weapons. In at least one instance a boresighted zoom lens camera, coupled to a television screen, was attached to a 57mm AA gun. With this equipment windows in Syrian held buildings could be monitored and engaged at ranges exceeding 2 kilometers.)

The Christian militiamen made several attempts to recapture the bridges, but were never able to coordinate the necessary concentration of forces nor were they willing to accept heavy casualties in the process. The Syrians likewise were content to shell militia headquarters buildings and not risk troops in an attempt to seize East Beirut. Indeed, the Syrian forces estimated they would suffer over 3,000 casualties in an attempt to take the 6 kilometer square area of Ashrafiyeh. Israel again sent a warning on October 6, by shelling Syrian positions with gunboats. On October 8, a cease fire ended the 8 days of fighting.

Syria failed to break the will of the defenders. Neither casualties nor destruction were inflicted at a level to force the Christian militias to capitulate or negotiate on Syrian terms. Lebanese casualties during the October fighting numbered about 800 dead and 3,000 wounded of which only 70-100 were combatant militiamen. Ten to twenty percent of the buildings (about 3,000) in East Beirut suffered varying degrees of damage. Syrian losses are unknown, but the Syrians are believed to have been disconcerted by the unexpectedly high casualty rate.

#### BAN ME THUOT

The battle of Ban Me Thuot in March 1975, was a first stage in the final North Vietnamese offensive that collapsed South Vietnam. With major diversionary attacks in Pleiku and Kontum provinces, three NVA divisions (320th, 316th, and 10th), totaling 25,000-30,000 troops, successfully slipped south to a vicinity generally west of Ban Me Thuot. An earlier ARVN intelligence estimate had correctly foreseen this main effort, but the warning was disregarded by the area corps commander. As a result the town was lightly defended when the NVA struck on March 10.

In and around the city the ARVN forces consisted of two battalions of the 53rd Infantry Regiment, some Regional Forces companies, an armored cavalry troop, and some headquarters units, totaling about 4,000 troops. The NVA 320th division, supported by T54 tanks, conducted the main assault on the city. Preceded by sapper and artillery attacks, the division objectives were the various headquarters within the town, an ammunition dump and airfield on the northern outskirts, and another airfield further to the east. Blocking positions were established around the town to prevent reinforcements from reaching the defenders.

South Vietnamese attempts to fly in two Regional Force battalions were thwarted by automatic fire. Their air support provided mixed results, hitting both friend and foe. Although some NVA tanks were destroyed by air strikes, a misdirected bomb demolished the sector headquarters, cutting communications and ending all hopes of organizing a cohesive defense.

The heaviest fighting occurred in the defense of the province chief's headquarters, the sector headquarters, and the forward command post of the 23rd Division. NVA tanks and artillery were employed in direct fire against these compounds. Fighting back, the defenders succeeded in knocking out five of these tanks near the division command post. By evening, however, the NVA held the center city although isolated pockets continued to resist. The ARVN forces also retained scattered positions east, south, and west of the city. A ranger and a marine battalion managed to reinforce positions west of the city. Fighting within the city ended the following day. An estimated 400 NVA troops had been killed and 13 tanks knocked out.

A battalion of the 53rd Regiment continued to repel repeated regimental-sized assaults on the airfield east of Ban Me Thuot. Here they were joined by remnants of other units that had been fighting outside the city. The ARVN 23rd Division now mustered a 5 battalion task force to attack west along Route 21 to link up with the airfield. On March 15, this force had barely gotten moving when its lead battalion was hit by elements of the NVA 10th Division. The situation was aggravated as the soldiers of the ARVN task force, which consisted largely of local units, abandoned the column to look for their families streaming out of Ban Me Thuot. Its morale broken, the relief force disintegrated. Meanwhile, the NVA 316th Division had also joined the fighting around the city. Running low on supplies, the defenders at the airfield held until March 18, when they withdrew to the east.

The North Vietnamese had apparently not planned to conclude the war in the spring of 1975. The South Vietnamese loss of Ban Me Thuot, however, precipitated their confused attempt to conduct a strategic withdrawal from the Central Highlands. This maneuver degenerated into the rout that the North Vietnamese exploited to achieve total victory in Vietnam.

## BEIRUT I

When the Lebanese civil war broke out in the spring of 1975, combat in the capital of Beirut assumed a central role. Much of this fighting, in turn, centered on control of the hotel and port districts.

The hotel district battles were largely static affairs with both sides exchanging shots while remaining under cover to minimize casualties. Each side committed no more than 300 men, with only about 60 taking part in the battle on any given day. (The Holiday Inn was defended by 16 men when it fell.) Sniping was conducted from the upper levels of the buildings while the entrances were sandbagged and defended by a few men. Tunnels were also used to bring forward supplies. Heavy weapons were largely restricted to mortars and RPG rocket launchers.

Skirmishing in the hotel district continued intermittently from April 1975 to May 1976. The most intense period of fighting, however, occurred between December and March. On October 27, 1975, Christian forces seized several hotels in the district. Sporadic fighting continued until December 8, when Moslem leftist forces launched a two pronged offensive to seize central Beirut and the Christian held Mediterranean seafront (which includes part of the hotel district). Lebanese Army forces stopped the drive towards the center of the city, but the leftists retook two of the three hotels lost in October. The Holiday Inn remained in Christian hands. On the following day Lebanese Army troops joined Christian militia forces and the contested hotels changed hands several times. By December 11, Moslem forces had again retaken all but the Holiday Inn. A few days later a cease fire was enacted. By January 10, major fighting had again erupted, although no real estate changed hands. The final phase of fighting occurred in March. Moslem forces seized the Holiday Inn on the 21st, lost it, and then took it for good on the 23rd. During the next several days the Moslems advanced to secure the remainder of the hotel district. The Moslem advance reached the port area by May 1.

The battle for the port area was the first in which some trained soldiers, rather than solely militiamen, participated on both sides. During the critical combat of the first week, the Christians deployed about 200 Phalangist militiamen along with 200 Lebanese Army regulars. Moslem forces probably were equivalent. With the recent disintegration of the Lebanese Army, both sides also acquired heavier weapons, including armored vehicles.

The Christian forces counterattacked to repel the Moslems and stabilize the lines on Allenby Street. Twelve Staghound and Panhard armored cars supported by three truck mounted twin ZU-23 AA guns spearheaded the advance. Mortars and artillery fires were also used. Phalangist militiamen helped drive the Moslems from side streets parallel to the main Lebanese army thrust. The combined fires of the vehicles' cannon and, especially, the ZU-23s crumbled the curtain walls of buildings and reduced them to their steel reinforced concrete frameworks. Upon reaching Allenby Street, the Christians demolished selected buildings and built a barricaded defense perimeter from rubble. Concrete embankments were also constructed to protect armored cars positioned on the perimeter. The Moslems attempted to bring forward M41 and Charioteer tanks to engage these armored cars, but the rubble in the narrow streets blocked their movement. Vehicle mounted recoilless rifles also failed, being unable to penetrate the concrete embankments shielding the armored cars.

During these first few days the Moslem advance was halted and the lines stabilized. When the fighting subsided, the Christian forces dwindled to about 80 men as did the Moslems. No further offensives were attempted against the port area, although pressure was maintained until the arrival of Syrian peacekeeping troops on November 15. The battle for Beirut concluded with the establishment of the "Green Line" separating Christian and Moslem forces in East and West Beirut respectively. Casualty figures for the two opponents are unknown.

## BEIRUT II

The siege of Beirut culminated the Israeli campaign to evict the Palestine Liberation Organization from Lebanon. Crossing the border on June 5, 1982, Israeli forces moved rapidly to eliminate PLO bases in southern Lebanon. By June 14, the PLO stronghold in West Beirut was completely isolated. Christian Lebanese Forces held the hills overlooking the city from the north while Israeli forces held the hills in the south and east. The Mediterranean Sea blocked escape to the west.

PLO forces totaled about 12,000-15,000 armed fighters, about half of whom had retreated to the city from southern bases. Additionally, there were about 2,000-2,500 Syrian troops trapped in the city, who, contrary to expectations, continued to resist. Most of the fighting involving Syrian forces, however, occurred on the outskirts of the city prior to the actual siege. (Syrian forces throughout the campaign avoided combat on a level that would lead to open confrontation with Israel.) Also there were about 1,500 soldiers of the Palestine Liberation Army (PLA), the "regular" army of the PLO. Nominally under the PLO, the PLA units in Beirut were in fact under Syrian control.

Heavy weapons included an estimated 40 tanks (T34s and possibly a few T55s), 18 artillery pieces, 10 122mm multiple rocket launchers, 20 heavy mortars (120mm and 160mm), and 50-75 antiaircraft guns of all calibers as well as a few SA 7 and SA 9 antiaircraft missiles. The PLO also had numerous AT weapons including towed AT guns, recoilless rifles, and rocket launchers. They also had about 250-300 vehicles including trucks mounting machine guns or mortars and a few APCs. Israeli forces around Beirut numbered 35,000-50,000. These armor-heavy forces were supported by artillery, fighter-bombers, and naval vessels mounting 76mm guns.

The speed of the Israeli advance did not permit large-scale defensive preparations. Roadblocks and a some poorly camouflaged minefields were erected at intersections. To be sure, there were also numerous defensive positions within the city and in the refugee camps in the southern suburbs. These positions included bunkers, trenches, and fortified basements, as well as tunnels connecting key buildings. Food and munitions were also stockpiled within the city. Such preparations, however, were largely a result of the internal Lebanese conflict and were not part of an overall defensive scheme against Israeli conventional forces.

The defense was also poorly coordinated. PLO leaders, largely familiar with only small unit missions, were inadequate in meeting the demands of large scale operations. Furthermore, PLO leaders were selected more by virtue of loyalty than skill. PLA and Syrian army units were the best organized, but were relatively inactive once the siege began in earnest.

Despite the inadequacies of the Palestinian defense, it was still more formidable than the Israelis were willing to take on in a full-fledged assault. Even disorganized resistance in urban combat could inflict far higher casualties than the habitually loss-conscious Israelis would accept. Additionally, extensive media coverage insured adverse world opinion towards Israel if widespread civilian casualties resulted.

Throughout the month of July, Israeli forces lay siege to West Beirut. This period was characterized by occasional artillery exchanges, negotiations, and small, isolated firefights. Israeli artillery fire and air strikes hit PLO positions. Care was taken to pinpoint targets to avoid civilian casualties. It had been hoped that the Lebanese Forces would actively move against the PLO, but this proved politically infeasible for the former who did not want to appear too closely aligned to the Israelis.

Psychological warfare operations were extensively employed during this siege. The goal was to force resident Lebanese and Palestinian noncombatants (especially the families of PLO fighters) to pressure the PLO to evacuate the city. Water and electricity were intermittently cut as part of this program.

On July 29, the PLO announced its decision to withdraw from Beirut. Convinced the PLO was stalling for time, the Israelis intensified military operations. The Israelis sought to give the impression of willingness to engage in full scale combat, but without suffering the casualties such a move would entail. On August 1, Israeli ground forces attacked in the south to seize the airport, while naval forces bombarded PLO coastal positions with Gabriel missiles and gunfire. In support of this effort the Israeli Air Force flew 127 bombing sorties in a 10 hour period. This was the beginning of Israeli "salami" tactics in which small areas were isolated and sliced off from PLO control a piece at a time. Alternatively, PLO areas were isolated to separate them from the non-Palestinian quarters of the city, although in this case the isolated sectors were not entered and cleared.

Israeli units attacked using company-sized teams with attached tanks and M109 155mm SP howitzers. Infantry advanced in the lead, but the tanks and SP artillery moved forward to engage points of resistance with direct fire. APC-mounted Vulcan 20mm AA guns also proved effective in this role. M113 APCs, considered too vulnerable for use in an assault, followed behind carrying supplies. Contrary to normal Israeli practice resistance was not bypassed, and advances were slow and deliberate to avoid casualties. Units advancing on parallel streets would often be supported by forces moving on a perpendicular axis to cut off retreating Palestinians. Movement was also conducted parallel to the Mediterranean or the "Green Line" (separating the PLO from Lebanese Forces) as these features served to secure the flanks.

The size and density of the urban areas precluded searching every room in a building. (The inner city of Beirut, of which West Beirut is a part, occupies 42 square kilometers and contains a population of 800,000.) Multi-story buildings were entered on the middle floors and cleared downward if necessary. Then forces were deployed at the entrance and on one of the floors overlooking the street. Despite the potential threat posed by not completely clearing each building, these tactics were generally successful since the Palestinians avoided close combat and usually evacuated the building.

The PLO defense relied primarily on the harassing fires of small groups moving from building to building. They did not attempt to hold fixed strongpoints. PLO heavy weapons were employed in a similar manner. Truck-mounted mortars or tanks (the latter used solely as mobile artillery) would emerge from side streets, fire a few rounds, and then return to cover or move to a new position. Poor maintenance and gasoline shortages eventually forced the abandonment of many of these vehicles.

On August 4, the Israelis attacked from positions on the "Green Line," moving west and north to close in on PLO areas. Air strikes continued with 36 sorties being flown on August 9, and 16 sorties each on the next 2 days. On August 10, the Israelis advanced again on the southern coastal axis. The heaviest air strikes of the war were launched on August 12 -- 72 sorties. Within a few days this increasing pressure forced the PLO to negotiate a withdrawal from Beirut. The agreement was implemented on August 21, and the withdrawal was completed on September 3.

The Israelis lost 88 killed and 750 wounded in combat in and around Beirut. Palestinian losses for the entire Lebanon campaign are estimated at 1,500 killed, although relatively few died during the siege. Perhaps 4,000-5,000 civilians also died throughout Lebanon. Israel won a crushing military victory over the PLO, but did not achieve the overall political objective of securing a stable and cooperative government in Lebanon. The operation also cost adverse opinion both within Israel and abroad, most significantly within the United States.

## BERLIN

The battle for Berlin was part of the final Soviet offensive to crush Nazi Germany and end World War II in Europe. On January 12, 1945, a massive Soviet offensive overran the German defensive line on the Vistula River in Poland. By January 26, leading Russian units were on the banks of the Oder River in Germany, only 40 miles from Berlin. From February until mid-April there were no major Soviet attacks on the Oder River front. The reasons for this delay are unclear although they appear to be related to the desire to eliminate bypassed German strongholds, resupply difficulties, and conflicts over strategic objectives in the face of overestimated German strength.

Meanwhile the Germans made few preparations for the defense of the city. Hitler, relying on the continued defense of the Oder, diverted critical forces in a fanciful attempt to retain the oil fields in Hungary. He was furthermore concerned with the effects on civilian morale if the city prepared for battle. Without Hitler's decision, no one dared to raise the issues of a defensive plan or evacuation of the bulk of the city's remaining 2,850,000 inhabitants. (Berlin's prewar population was 4,339,000.) In Berlin, the threat of Russian armies seemed strangely remote compared to intensified Allied, especially American, bomber raids. The city was bombed 83 times between February 1 and April 21 with the only quiet period being the night before Easter. In any case, a public order for the defense of Berlin was not published until March 9, and this was largely a rhetorical appeal to "fight to the last man." The means for defense simply did not exist.

The only troops initially dedicated to the defense were the Luftwaffe antiaircraft gun crews of the 1st Flak Division. To this was hastily added ad hoc units of all military services, police, Hitler Youth, political and service organizations, and the old men of the Volkssturm (the home guard militia). In theory this force numbered over 41,000 men although only 15,000 were military and police personnel and few of these were trained for ground combat. An additional 52,000 men supposedly could be mustered on an alert. Insufficient weapons existed to arm these forces. The means for their command and control was similarly lacking. In reality, most of these ad hoc forces never materialized. In the few such units that were actually mobilized, many men deserted at the first opportunity, returned to their homes and awaited the ending of the war. Berlin was ultimately defended by an organized force of about 25,000 men, mostly from the LVI Panzer Corps, the 1st Flak Division, and SS detachments within the city.

These forces were totally inadequate in numbers and equipment to defend the three defensive rings that were designated around the city. The outer perimeter, 100 kilometers in circumference, ran on the outskirts 30 kilometers from the center of the city. The second ring lay roughly 15 kilometers from the center and the third defensive perimeter traced the S-Bahn, the elevated suburban belt railway. This defensive area was divided into eight pie shaped sectors, each with its own commandant. The defense plan called for each commandant to take control of any additional combat troops in this sector when the battle started. A small inner defensive sector was also established around the government quarter and designated as the "Citadel." With sufficient troops, the third, S-Bahn, perimeter would have been formidable defenses.

To compound the problem of insufficient forces, preparation of defensive positions was also less than anticipated. Existing defenses within the city were restricted to several huge multistory air raid bunkers and six flak towers. (These bomb-proof flak towers rose 130 feet above the city and were designed to elevate antiaircraft guns above obstructing buildings.) Additional positions and barriers had to be built by hand as all available construction machinery had been sent east to work on the Oder River fortifications. Furthermore, no more than 30,000 laborers of a supposed 100,000 man force were working on the Berlin defenses. Finally, comically poor mismanagement of even this effort resulted in less work being done than was possible.

On April 16, the long-awaited Soviet offensive toward Berlin opened. Within the next few days this thrust was joined by Soviet armies advancing along the width of Germany from the Baltic Sea to Czechoslovakia. The First Belorussian Front (equivalent to an army group) made the main push toward Berlin while the Second Belorussian Front struck north of the city and the Second Ukrainian Front drove across Germany to the south. The first Belorussian Front was comprised of eleven armies totaling 7 tank and mechanized corps (equivalent to a U.S. division), 77 rifle divisions, and 8 artillery divisions, plus numerous independent artillery regiments and rocket brigades. This force contained 16,934 artillery pieces and 3,155 tanks and SP guns. Facing them was the German Ninth Army with 14 depleted divisions with 344 artillery pieces, 300-400 antiaircraft guns (usable as artillery), and 512 tanks and SP guns. With five armies in the van, the Russians made initially slow progress, but eventually succeeded in breaking forces through on the flanks of the Ninth Army and threatening its encirclement. Berlin came under long range artillery fire on the 21st.

On April 22, Hitler ordered the four divisions of the LVI Panzer Corps to defend the eastern part of the city. With the loss of these divisions from Ninth Army, the encirclement of the latter east of Berlin was made certain. On April 24, elements of the First Belorussian and Second Ukrainian Fronts joined southeast of the city to encircle the Ninth Army and cut off its link with Berlin. The following day, the two forces again joined 100 kilometers southwest of Berlin to complete the encirclement of the city. On this same day, the 25th, Russian forces met advancing American forces on the Elbe River. Meanwhile eight Soviet armies were sweeping through the suburbs against little resistance and closing in on the S-Bahn perimeter surrounding the inner city. These combined armies presented a force of 464,000 men, 12,700 guns and mortars plus hundreds of Katyusha multiple rocket launchers, and 15,000 tanks and SPO guns. The Soviet Air Force had also assumed domination of the skies over Berlin (the last raid by the western Allies was on the 21st). On the 24th, 1,486 Russian aircraft attacked the city. Throughout the battle, two Soviet air armies repeatedly struck Berlin with hundreds of planes until the proximity of advancing forces precluded further aerial bombardment.

Chaos reigned within the city. Communications, dependent on commercial telephones from the beginning, had largely deteriorated. The civilian population, long since reduced to living in "cellar tribes," retreated to their shelters to await the inevitable collapse while Soviet artillery rained on the city. Bombing had largely destroyed power and water utilities and food was becoming scarce. Groups of SS personnel roamed the streets shooting "traitors" who abandoned their positions. Finally, marauding bands of second echelon Russian troops who followed the disciplined combat units, added widespread rape and looting to the sufferings of the population. Meanwhile, Hitler, in his bunker beneath the ruins of the Chancellory building, planned relief operations with units that had practically ceased to exist.

The battle for Berlin had already been decided by the fighting outside the city. A coordinated, cohesive defense was impossible. Despite bitter resistance at points within the city, the Russians were mainly faced with a large-scale mop-up operations. Movement was relatively slow as artillery barrages preceded each advance. Shelling continued throughout the battle from artillery massed hub to hub from every available piece of open ground. In lieu of committing infantry to costly attack, tanks and direct firing artillery smashed buildings containing snipers or Panzerfaust (a shoulder-fired AT weapon) gunners. With final victory in reach, few soldiers wanted to be heroes.

After some tank losses to Panzerfaust ambushes, assault groups were routinely formed with combined arms in different variations. A common technique was to combine a tank and an infantry battalion supported by an artillery battalion and up to a company of sapper plus a flamethrower platoon. This force would advance along two or three streets. If heavy resistance was encountered on one street, forces were shifted to bypass it on the adjacent street axes. A reserve was retained to eliminate bypassed resistance when required. When encountering an obstacle that could not be bypassed, the artillery shelled the building covering the obstacle. When available, the flamethrower units also attempted to set these buildings on

fire. Then sappers destroyed the obstacle under the cover of infantry and tank fire. Alternatively, the obstacle could be destroyed by the direct fires of the tanks and artillery. The tanks would then rush through to penetrate the defenses and occupy key intersections. The infantry mopped up and then rejoined the tanks for another bound forward.

By nightfall of the 26th the Berlin defenders were pushed into a pocket about 15 kilometers long from east to west and 1.5 to 5 kilometers wide. Telephone communications had been cut and a radio with a balloon hoisted antenna now provided the defenders their only link with the outside world.

The fiercest fighting occurred in the vicinity of the Reichstag and the Tiergarten (zoo) about a mile to the west of it. The Reichstag battle was particularly bitter. (This parliament building, unused since the 1933 arson fire, was curiously regarded by the Russians as the symbol of Nazi Germany and special "victory flags" were issued to be emplaced after its capture.) The massive Reichstag building lay in the heart of the "Citadel" sector in a bend of the Spree River. The building faced westward across the open Koenigsplatz toward the Imperial Theater (a.k.a. Kroll Opera House). To the northwest, massive buildings, including the Ministry of Interior, lined the southern bank of the Spree bend. Two Soviet divisions made the attack. In each battalion, two assault groups, with supporting SP guns, were formed. On the night of April 28-29, two Russian battalions seized the Moltke Bridge over the Spree River, damaged but intact after an unsuccessful German demolition attempt. The assault force cleared it of obstacles, fought off several German counterattacks, and secured a foothold in some corner houses opposite the bridge. At 7:00 a.m. the next morning, the main attack began after a ten minute artillery barrage on the Ministry of Interior, which still dominated the bridge. The SS defenders put up a bitter resistance and the building was not taken until 4:30 a.m. on the 30th. Meanwhile, the other assaulting division had secured the adjacent block of houses to the north. A third division was committed to take the Imperial Theater while the other divisions assaulted across the 400-meter-wide Koenigsplatz to seize the Reichstag. About 90 guns plus Katyusha multiple rocket launchers were brought up to support the attack. Much of the artillery engaged the building with direct fire. The smoke from burning buildings and the dust raised by the bombardment wrapped the battlefield in a haze that blocked out the sun.

Despite overwhelming Soviet firepower, three separate attacks were beaten back by German fire and counterattacks. The Russians were further blocked by a great trench, part of the uncompleted underground railway system, that cut across the Koenigsplatz. A final three battalion attack at 6:00 p.m. succeeded in breaking into the building, but fighting continued in the interior until the morning of May 2 when the Germans holding out in the basement surrendered. About half of the estimated 5,000 man Reichstag area garrison had been killed and the remainder, including wounded, had been captured.

As the Reichstag was being stormed on the 30th, Hitler committed suicide in his bunker a quarter mile away. Early the next morning, the acting chief of staff of the German Army High Command began negotiations for an armistice agreement until the new German government under Admiral Doenitz could be formed. The Soviets correctly interpreted this move as an attempt to stall for time in the vain hope that division among the allies would create more favorable surrender terms. The Russians refused anything less than unconditional surrender and, to accent that point, fired a massive artillery barrage with every available gun within the city. On May 2, the Germans surrendered Berlin. Five days later the war in Europe was ended.

Berlin was largely in ruins and probably 100,000 of its residents killed, mostly due to Allied air raids. Military casualties for both sides are impossible to determine for the urban fighting.

#### CHERBOURG

By June 17, 1944, U.S. Forces advancing west from the Normandy beachhead succeeded in cutting off the Cotentin Peninsula. Two days later the VII Corps, with three divisions (4th, 79th, and 9th) attacked northward towards the port city of Cherbourg. The battered elements of four German divisions withdrew to a perimeter surrounding the city. (Hitler had denied permission for these badly needed combat divisions to break out of the peninsula, thus ensuring their loss in the oncoming battle.)

The perimeter was a 30-mile long semicircular ring of fortifications sited on high ground 4 to 5 miles from the city. Fortifications included many trenchlines and concrete bunkers. Coastal defenses on the English Channel covered the rear.

German defenders numbered between 25,000 and 40,000 men. This was a mixed force, however, much of which was of dubious fighting quality. In addition to the army divisional troops, were Luftwaffe antiaircraft crews, sailors, V-1 rocket personnel, and workers from the Todt labor organization. Some of the defenders were less-than-enthusiastic Russians and Poles who had volunteered for German service to escape the rigors of a prisoner of war camp. The defenders' firepower included large numbers of antiaircraft guns of all calibers.

A channel storm and high tides meanwhile jeopardized Allied resupply efforts over the Normandy beaches. Therefore, at the time, seizing the Cherbourg port assumed even greater importance to Allied logistical plans.

On June 21, a surrender ultimatum was broadcast, but no reply was received. The next day the Americans attacked the defenses south and southwest of the city after air and artillery bombardment. (Interestingly, the extensive naval gunfire that was also available was never used in support of the battle. This is probably because of the threat of German heavy coastal artillery further west of the point of the peninsula.) To aid in the planning for this attack, U.S. maps were overprinted with highly accurate locations of German defenses that had been pinpointed during the

pre-invasion intelligence effort. The air bombardment began with over 20 minutes of strafing attacks by ten squadrons of RAF fighters followed by an hour of bombing and strafing by 562 U.S. fighter-bombers. Finally, at H-hour, 387 light and medium bombers began an hour long aerial barrage in front of attacking troops. The bombing was scattered, however, and not largely effective in knocking out the German positions, although it cut communications and lowered the morale of the defenders. Artillery proved more effective in hitting enemy defenses. The failure of the air attack is largely attributed to hasty planning and lack of coordination with the ground forces.

Combat to reduce each strongpoint became necessary. On June 23, the Germans designated General von Schlieben, hitherto commanding the remnants of two divisions, as fortress commander with control over all forces in the Cherbourg sector. The next day U.S. infantry supported by tanks, fighter bombers, and artillery, breached the perimeter defenses.

A second surrender appeal was ignored on June 25th. American forces were now fighting in the city itself. The 4th Division penetrated the town from the east, while the 79th Division entered in the south and the 9th Division in the west. Fighting centered on strongpoints within the city and on its immediate outskirts. Among them was Fort du Roule which took 2 days to capture. Some German units quickly surrendered while others continued to resist. Tank destroyers and tanks did not prove effective against German bunkers within the city, but did prove useful in eliminating rooftop 20mm flak guns which were being used against ground targets.

On June 26, General von Schlieben was captured with 800 troops in his underground position. He refused, however, to order the surrender of the remainder of the city's garrison. American psychological warfare detachments immediately exploited the theme of the commander "saving his own skin" while allowing the continued sacrifice of his own troops. The effect of this appeal is unknown, but ad hoc German units that had been recently formed for combat showed a marked willingness to surrender, especially when their communications were cut off. Four hundred more prisoners were captured when the City Hall position surrendered. All together 10,000 prisoners were taken on the 26th and 27th. On June 27, organized resistance ended when the Naval Arsenal capitulated, although small parties continued to resist in the dockyard area until they were mopped up.

The decisive battle for Cherbourg was fought for the strongpoints outside the city. Despite stubborn resistance at points within the town, collapse came relatively quickly once the town was entered. Hitler had expected to hold the "fortress" for much longer and would later often contrast the poor showing with the over-two-month-long defense of the port of Brest. The Cherbourg defenders, however, did manage to thoroughly destroy the port facilities. This "masterful job" of demolition prevented Allied use of the piers until August 6.

## HUE

On January 31, 1968, the North Vietnamese Army and Viet Cong forces launched their Tet Offensive at targets throughout South Vietnam. As part of this operation, two NVA/VC regiments and two sapper battalions totaling 6,000 men conducted a surprise attack to seize the city of Hue.

Hue was the old capital of the Vietnamese emperors and its most notable feature was the walled citadel, or old city, lying north of the Perfume River. The citadel occupied about 8 square kilometers, approximately, half of the city. The outer wall was an earth and stone rampart 20 feet thick and 25-30 feet high and surrounded by a moat. Many of the buildings inside, such as the imperial palace, were of similarly substantial stone construction. A small airfield lay within the citadel as well. East of the citadel was a residential and market area, and to the south of the river was the newer portion of the city. The population was about 140,000.

Communist forces quickly occupied most of the city against little resistance. However, they were unable to capture the headquarters of the 1st ARVN Division in the northeast corner of the citadel or the U.S. MACV compound on the south bank of the river. Relief forces were immediately dispatched. Two U.S. Marine companies with four tanks fought their way to the MACV compound which they held against heavy attacks. Three ARVN battalions and an armored cavalry squadron arrived on the following day, although all had been engaged en route. Counterattacking from the 1st Division Headquarters area, ARVN forces seized the airfield on February 2. Reinforcements for both sides continued to arrive during the succeeding days, with the ARVN forces making great use of the river to bring in troops by landing craft. Eventually 11 ARVN and 3 U.S. Marine battalions were committed. The NVA/VC forces increased to 16 battalions, the equivalent of two divisions.

By February 10, U.S. Marines had cleared the south bank of the river. On February 13, the marines crossed the river to join ARVN troops in the fierce fighting for the citadel. The original policy had been not to bomb or shell the old city, but these restrictions were dropped as the combat intensified. Low cloud cover throughout the battle severely limited the use of air support. Artillery, including 8 inch naval guns, was extensively used. To provide direct fire support, the marines used M48 tanks, M42 40mm SP AA guns, and 106mm recoilless rifles (including ONTOS SPs, mounting six such weapons). Tear gas was also used.

On February 16, artillery fire killed the communist commander. A subsequent communist request to withdraw from the city was denied by headquarters. Three days later, however, senior NVA/VC personnel evacuated the city under the cover of a counterattack. On February 21, three battalions of the U.S. 1st Cavalry Division conducted an air assault operation 5 kilometers northeast of Hue. This operation eliminated an NVA regimental headquarters and effectively cut communications and supplies with the increasingly disorganized defenders. On February 24, ARVN troops finally eliminated the last resistance in the imperial palace, ending the fighting in the citadel. The next day an ARVN ranger task force cleared the market and residential area. The last operation was perhaps made easier because the ranger commander was a native of that district.

The 25-day-long battle had destroyed about 80 percent of the houses within the citadel. ARVN casualties were 213 killed and 879 wounded. U.S. Marines suffered 53 killed and 380 wounded. A captured NVA document later confirmed at least 1,042 NVA were killed and several times that number were wounded which, along with 89 captured, amounts to about 5,000 total communist casualties. The civilian population, however, endured the worst horrors. During their occupation of Hue, the communists rounded up and executed at least 2,800 civilians.

## JERUSALEM

When the Six Day War broke out on June 5, 1967, Israel did not anticipate more than token Jordanian participation in the Arab cause. Jordanian artillery fire, however, coupled with other military actions prompted an immediate Israeli operation to seize all of Jerusalem and the West Bank.

Israeli forces in the battle for Jerusalem included an armored brigade, an infantry brigade, and a parachute brigade. The Harel Armored Brigade was a regular army formation composed of a tank battalion and two armored infantry battalions carried in half tracks. The Jerusalem (or Etzioni) Brigade consisted of local reservists with the fixed mission of defending Israeli West Jerusalem. This brigade had seven infantry battalions and a tank battalion (with 32 Sherman tanks), plus supporting arms. The 'Q' Parachute Brigade (for security reasons, the Israelis often do not cite unit numerical designations) was also a reserve unit, but its members were not locally recruited and therefore were not intimately familiar with the intricate layout of the city. Nor was detailed reconnaissance possible. The brigade was preparing for an airborne drop in the Sinai when it was rushed to Jerusalem only hours before the attack. The experience of its three battalions varied considerably.

Jordanian forces consisted of the three battalion 27th Infantry Brigade with supporting arms, including an artillery regiment with eighteen 25 pounder field guns. A tank battalion and two more infantry battalions were also in the Jerusalem area although these units were each from different brigades and not responsible for the defense of the city. Finally there were a few armed civilians available. These were the products of a recently formed popular resistance committee. Civilians were never issued arms in the quantities envisaged and their contribution in the battle was minimal.

The Jordanian defenses centered on strongpoints that had been constructed over the previous several years. These strongpoints were positioned on high ground in and around the city. Most covered the 1948 Armistice Line that served as the Israel-Jordan border and divided the city. The Jordanians made few further defensive preparations. Buildings were not reinforced to create strongpoints, nor were obstacles emplaced to block the streets. Yet, Arab-held West Jerusalem (including the walled Old City), with its densely packed stone buildings and narrow winding streets, could have been converted into a formidable defensive zone.

The Israeli plan was to first push the Jordanians off high ground overlooking Israeli territory, then penetrate and cut off reinforcement routes into the city. This part of the operation began on the afternoon of June 5, with the Harel Armored Brigade attacking north of the city, and part of the Jerusalem Brigade attacking from West Jerusalem just south of the Old City. The remainder of that brigade remained in defensive positions on the north and east perimeter of West Jerusalem. Finally, the Parachute Brigade, supported by tanks from the Jerusalem Brigade, was to the assault into Arab Jerusalem to secure the Jewish enclave at Mount Scopus and to seize the sacred Old City.

After an artillery preparation, the paratroopers began the assault across the Armistice Line north of the Old City at 2:00 a.m. June 6. Jordanian defenses consisted of concrete and stone bunkers usually connected by trenches and protected by barriers of barbed wire, antitank obstacles, and minefields. It took 5 hours to overrun these defenses. Indeed, the heaviest fighting of the entire war occurred in capturing the Ammunition Hill strongpoint. Here the Israelis lost 50 men killed and at least three times that number wounded, while 106 of the 200 defenders were killed and most of the remainder wounded.

Fighting continued in houses as the Israelis continued to advance. At daylight, the tanks moved closer to provide point blank supporting fires. The Jordanian defense, however, was largely uncoordinated, although small groups continued to fight from houses as the Israeli advance continued. Moving too rapidly, and often mounted in half tracks, the Israelis were vulnerable to sniper fire from the rear. Several houses had to be cleared more than once. Resistance lessened as the Jordanians withdrew eastward. Mount Scopus was reached and by 10:00 a.m. Israeli forces were at the north wall of the Old City where they were met with fires from within.

Before assaulting the Old City it was decided to clear the dominating high ground to the north and east. A mounted attack against the northernmost position on the Augusta Victoria ridge was defeated by the fire of Jordanian antitank guns with the loss of six vehicles. When two airstrikes failed to knock out the guns, a second assault was delayed until nightfall. Again supported by air strikes this second attack also failed when the tanks took a wrong turn and were hit with antitank fire from the walls of the Old City.

Meanwhile in the north, the Harel Armored Brigade cut the road to Ramallah, fought its way south into Jerusalem, and then was ordered to return northward to capture Ramallah. In the south, the Jerusalem Brigade had mixed success. They succeeded in penetrating the defenses south of the Old City, but were driven back from the walls by mortar fire. Further south, they had not completely cleared the high ground on the frontier that controlled the road to Bethlehem. To the west, Israeli airstrikes prevented Jordanian reinforcements from arriving from Jericho.

On the morning of June 7, the Israelis conducted their final attack to seize the Old City. Two battalions attacked to clear the high ground to the north and east, only to find the Jordanians had evacuated these

positions during the night. The remaining battalion assaulted on foot and in jeeps through a small gate in the east wall. Shortly thereafter they were met by Arab officials who informed them the Old City had also been evacuated and would surrender without a fight thereby avoiding irreparable damage to its historic structures.

Israel had won a brilliant victory. The cost, however, had been high. The Parachute and Jerusalem Brigades had a total of 125 men killed and many times more wounded, accounting for over one-fifth of the Israeli casualties for the entire war.

#### KHORRAMSHAHR

Following a period of border clashes, the Gulf War broke out with Iraq's invasion of Iran on September 23, 1980. A force equivalent to roughly three divisions conducted a three pronged offensive into Iran. (This force was later doubled in size.) About two-thirds of this force was committed to the southern thrust. Part of this force crossed the Shatt al-'Arab waterway, turned south, and slowly advanced to seize the city of Khorramshahr, 10 kilometers from the border.

Khorramshahr lies on the east bank of the Shatt al-'Arab at its junction with the Karun River. The city serves as the commercial port for Abadan, further to the south. (The larger city of Abadan had only a small oil port.) Most of Khorramshahr lies on the north bank of the Karun with a single bridge connecting the southern portion on the Abadan Island. The city, with a population of 175,000 had grown rapidly since World War II and was Iran's largest commercial port.

Khorramshahr did not have great strategic significance except perhaps as an approach to Abadan. The Iraqi desire to capture it appears to have been largely a matter of prestige, particularly since Iraqi radio had announced its fall within hours of the invasion. Indeed, capture appeared certain as Iranian regular forces evacuated the city along with a large proportion of the civil population. The fanatical Pasdaran Islamic militia, however, decided to defend the city. They were augmented with volunteer militias, and smaller groups such as police and armed forces trainees. There were about 2,000-3,000 of these defenders when the Iraqis entered the city. Weapons included some artillery and a few Chieftan tanks. The Iraqis attacked with elements of an estimated reinforced armored division with a total strength of 15,000-20,000 troops and 500-600 tanks.

Iraqi tactics were premised on avoiding casualties by using the firepower of tanks and artillery alone to evict the defenders. They were reluctant to employ infantry, especially in house-to-house combat. The Iraqi commanders were lacking in aggressiveness and imagination. The tanks moved slowly and were often dug in at the conclusion of a limited advance. These tactics made armor vulnerable to Iranian ambushes and counterattacks. Extensive Iranian sniping also was effective in discouraging Iraqi movements. Overall, the battle pitted the better trained and equipped, but poorly led, Iraqi regulars against the poorly organized and equipped, but zealous Iranian militia.

Fighting on the northern outskirts of the city began on September 28. The Iraqis lost some armored vehicles and a special forces unit was repulsed attempting a boat crossing from the east. Iraqi forces succeeded in penetrating the city, but casualties forced them to temporarily withdraw. The Iranians now recognized the potential of the city to delay the Iraqi offensive, and increased the shelling of Iraqi positions outside the city. Iranian F4 aircraft also occasionally interdicted Iraqi road movements.

On October 1, Iranian paratroopers arrived by helicopter to reinforce the defense. Subsequent Iraqi attacks increased in intensity. A seesaw battle of attacks, ambushes, and counterattacks developed as battle lines shifted back and forth within the city. Eventually the Iraqis made some gains in the eastern port area. During this period electricity and water were cut off for large portions of the city. Iranian supply routes into the city were also under bombardment and only intermittently passable.

On October 5, the Iraqis declared a unilateral cease fire in an attempt to enter a negotiation phase, presumably to achieve recognition of their territorial gains in Iran. The Khomeini government refused to acknowledge the cease fire.

The following day the Iraqis renewed the attack on Khorramshahr. This time, however, a coordinated assault was conducted. Artillery and air attacks preceded the tanks and infantry (special forces). The Iranians were gradually pushed back, often in close combat, and the eastern dockyards were captured.

Smaller scale combat continued during the succeeding days as the Iraqis conducted a slow, deliberate advance in an effort to avoid casualties. Iraqi forces crossed the Karun River 30 miles north of Khorramshahr and made a flanking movement to cut off the city. Meanwhile, on October 12, Iraqi special forces attacking westward succeeded in reaching the Karun River bridge to Abadan Island. Four more days of intermittent fighting, however, were needed to clear the corridor to and over the bridge. About 300-500 defenders remained in the central city. Long since short on food, water, weapons, and ammunition, they were now completely cut off from all supplies. The Iraqis mopped up these last defenders from October 16-24.

The battle for Khorramshahr had been a costly affair. Iraqi casualties were high, although reliable figures are not available for either side. The battle was significant because of the month long delay it imposed on the Iraqi southern offensive. During this period, Iranian forces were able to organize and redeploy. Furthermore, the winter rains followed shortly thereafter, turning much of the region into a sea of mud and largely halting further Iraqi efforts.

## MANILA

By the last week of January 1945, U.S. forces had completed the first phase of the Philippines campaign on Luzon. Attention now turned to the liberation of the capital city of Manila, the most important objective on the island. The XIV Corps (37th and 1st Cavalry divisions) approached the city from the north. Meanwhile, the 11th Airborne Division conducted a parachute and amphibious landing 90 kilometers southwest of Manila.

In 1945, the Greater Manila area extended 285 square kilometers and contained a population of 1,100,000 of which over 800,000 inhabited the city proper. The city itself covered 37 square kilometers, stretching 9 kilometers north-south along the eastern shore of Manila Bay and extending 7 kilometers inland. Buildings varied from thatched huts to modern multistory reinforced concrete structures. The Pasig River flowed through the center and divided the city in half. On the southern bank of the river, just inland from Manila Bay, was the old Spanish walled city of Intramuros.

The Japanese commander of the Philippines did not intend to defend Manila. The local naval commander, however, independently chose to hold the city. His force of 17,000 men (14,000 in the Manila area) consisted largely of naval personnel, untrained for ground combat. The 4,500 army soldiers in this force were mostly service troops supporting the evacuation of the city when they became trapped. A total of 10,000 men were deployed within the city limits. The defenders' arms included an unusually high proportion of automatic weapons. Many of these were stripped from sunken ships and wrecked aircraft as well as from numerous antiaircraft positions. Over 1,100 20mm and 25mm automatic cannons were obtained along with numerous machine guns. Hundreds of mortars ranging from 50-150mm were also available. The mixed bag of naval guns and field artillery included at least 85 pieces ranging from 100mm to 150mm. Of these 60 were 120mm (5 inch) naval guns, mostly emplaced near Nichols Field south of the city. Additionally, there were 200mm and a few 450mm rockets. Japanese defenses were stronger in the south where the Americans had long been expected to land prior to an advance on Manila.

Consideration for the civilian population guided U.S. tactical operations. To minimize destruction and casualties, General MacArthur forbade air attacks and confined artillery fire against observed pinpoint targets. Seizing water facilities and power stations became priority objectives in light of the needs of over a million Filipinos.

U.S. forces entered the city on the evening of February 4. The Japanese were surprised, not expecting an attack for 2 more weeks. Scattered pockets of resistance were largely overcome with tank and artillery fires. The 37th Division reached the north bank of the Pasig River on February 6. The 1st Cavalry Division completed clearing the eastern suburbs and securing water facilities by February 10. The effects of American firepower were evident in U.S. losses of only 50 dead and 150 wounded in contrast to 1,500 Japanese killed in fighting north of the Pasig River.

On February 7, the 37th Division assaulted across the river in rubber boats and amphibious tractors about 1500 meters west of Intramuros. The 1st Cavalry Division followed on February 9 and 10. With increasing Japanese resistance, the limitations on artillery fire were lifted, although the restrictions on air strikes remained in effect throughout the battle. (MacArthur's persistence in this regard made increasingly little sense as artillery alone proceeded to devastate the city.) As the 37th Division fought westward, the 1st Cavalry Division struck south and then swung into place on the left flank of the 37th. Meanwhile the 11th Airborne Division, now attached to XIV Corps, broke through at Nichols Field and completed the isolation of the city.

The battle now turned on reducing Japanese strongpoints east and south of Intramuros. Although fighting occurred throughout the southern part of the city, major resistance centered on a few strongpoints. Each strongpoint consisted of at least one major multistory building usually surrounded by clusters of other defended buildings. Major strongpoints were the stadium complex, Manila Hotel, New Police Station, City Hall, Post Office, and the university-hospital complex. Obstacles blocked the streets surrounding these strongpoints. These street obstacles included barbed wire, barriers of motor vehicles and trolley cars, concrete or sand-filled oil drums, and even dismantled factory machinery. Minefields were also emplaced, although they were poorly camouflaged and not well integrated into the defense. In addition to standard land mines, expedient devices were made of every available explosive from depth charges through artillery shells and aerial bombs. Within the strongpoint buildings themselves, the Japanese constructed sandbag barricades and bunkers in the doorways, corridors, and stairways. Tunnels connected the basements of various buildings or led to outside bunkers. Over 200 defenders would occupy a single major building within a strongpoint area.

Hundreds of tank and artillery rounds were expended on each strongpoint, but attackers entering the buildings were frequently expelled during fighting in the interior. Attackers entering the ground floor, for example, were sometimes driven out by grenades dropped through holes from the upper floor. The Japanese frequently reinforced their positions at night when the Americans ceased infantry assaults. The supporting buildings generally had to be taken to isolate the central building within the strongpoint. Intensive bombardment paved the way for the final assault on the rubble building. Yet the Japanese continued to resist and rarely surrendered. The defenders were frequently driven into the basements where they were burned out by flamethrowers. When even this means failed, engineers poured a mixture of oil and gasoline into the basements and tunnels and ignited it.

The strongpoints took from four to ten days each to clear. American casualties were seldom high on a daily basis, but attrition over time was taking a heavy toll, particularly since the casualties were being almost exclusively suffered by the front-line troops of the infantry. Non-battle casualties such as heat exhaustion also took their toll. The civilian population increasingly suffered as well. In addition to the civilian casualties unavoidably inflicted by American artillery, Japanese forces

began to commit widespread atrocities that increased as their command and control disintegrated. The last strongpoint fell in the university area on February 23, the date of the assault on Intramuros.

Already as early as February 17, heavy artillery, including two 240mm and four 8-inch (203mm) howitzers concentrated on breaching the north and east walls of Intramuros. These stone block walls were 40 feet thick at the base, up to 25 feet high, and 20 feet wide at the top. The 8-inch howitzers, even in indirect fire, were particularly useful for this task because of their uncanny accuracy. One hundred and fifty 8-inch rounds breached the east wall. A lone 155mm howitzer firing directly at 800 yards assisted in making another break in the east wall. (Unfuzed 155mm rounds proved most effective in opening an initial fissure. These were followed by delayed fuzed shells). More artillery moved in position and added their fires in preparation for the assault on February 23.

The assault was preceded by a massive hour-long artillery, tank, and mortar preparation. Artillery and tanks fired 7,800 rounds totaling 185 tons while 4.2-inch mortars added 3,750 more rounds (45 tons) to the bombardment. The 37th Division assaulted with one battalion across the river from the north while two more battalions broke in through the northeast corner. These assaults were further supported by artillery laying a smoke screen within the walls to seal off the southern third of Intramuros to prevent observation and reinforcement of the northern portion. By the next morning Intramuros was largely cleared. The 37th Divisions losses were about 25 killed and 265 wounded. The Japanese had 1,000-2,000 killed and 25 taken prisoner. This disparity in casualties reflects the effectiveness of the artillery bombardment which killed hundreds and disorganized the survivors.

The last resistance centered on three massive government buildings south of Intramuros. These heavily reinforced concrete buildings were similar to those found in Washington, D.C. and had been built to withstand earthquakes. Preparatory fires lasted 2 days and included 105mm and 155mm howitzers, tanks, tank destroyers, and mortars. A 155mm howitzer battalion proved most effective, firing directly at ranges from 150-800 meters. Assaults began on the morning of the 26th by elements of both divisions. The process of sustained bombardment and infantry attack was repeated several times, but the buildings were slowly reduced. On March 3, the final resistance in the Finance Building was eliminated and the battle for Manila ended.

XIV Corps lost 1,010 killed and 5,565 wounded in the month-long operation. (This includes 250 killed and 750 wounded in the 11th Airborne Division's fight south of the city.) The Japanese lost about 16,000 men killed in and around the city. An estimated 100,000 Filipinos lost their lives and their city was largely destroyed.

## ORTONA

In November 1943, the V Corps, British Eighth Army, crossed the Sangro River and began a slow advance up the Adriatic coast of Italy. On December 20, the old port town of Ortona had been reached by troops of the 1st Canadian Division. The town was characterized by narrow, 4-story brick houses built wall to wall. Streets were narrow with only the main thoroughfares being wide enough for tanks. From north to south the town stretched about 1400 meters. The average width of the town was 475 meters, being restricted by a steep cliff leading to an artificial harbor in the east and a deep ravine in the west. Thus, a highway approaching the town from the south was the only major avenue open to the attackers.

Ortona was defended by a battalion of the 3rd Parachute Regiment of the elite German 1st Parachute Division. The German commander had previous urban combat experience in Sicily. He decided to defend the northern half of the town. The southern half was extensively mined and some of its buildings booby-trapped with delayed charges. (One of the timed explosives later wiped out an entire Canadian platoon.) Buildings were demolished to create obstacles and clear fields of fire. Only the first 275 meters of the main road was left free of blocking debris. The Germans intended to canalize the attackers along this avenue and engage them in a kill zone at the town square. The front walls of buildings opposite German positions were demolished to expose the interiors to fire. Piles of rubble that provided potential cover to attackers were mined and covered by automatic weapons. Antitank weapons were also often sited to engage the vulnerable undersides of tanks attempting to climb over the rubble piles. Finally, strongpoints were linked by "mouseholes" to permit the unexposed movement of troops between positions.

On December 21, the soldiers of the 2nd Canadian Brigade began to move into the town. Advancing on a two-company front, they cleared several houses on the southern outskirts. The following day the trap leading to the city square was discovered. It was decided to clear both sides of the main street so tanks could move in to support the assault. The attackers moved in with three companies abreast on a 250 meter front.

The Canadians were unfamiliar with this type of combat and had to develop techniques in the course of the battle. Eventually, company objectives were divided into precise platoon and squad assignments. Each building was reported cleared before continuing to the next. Guards remained in each cleared building to prevent the Germans from reoccupying the position. Tanks supported the infantry with close-range 75mm gunfire against strongpoints as well as providing covering machine gun fire. Tanks also assisted in bringing ammunition forward and in evacuating the wounded.

The close combat prevented effective use of supporting artillery. Therefore, 6 pdr (57mm) and 17 pdr (76.2mm) antitank guns provided fire support. Two 6 pdrs supported the advance on the main street by firing into windows along either side of the street ahead of advancing infantry. When German fire prevented sappers from demolishing rubble blocking the

streets, the guns blew the tops off the piles to enable the tanks to cross them. In the house-to-house fighting, AT guns fired armor piercing shells to pierce the walls and then fired high explosive shells through the breach into the interior of the building. Two 17 pdrs, on a ridge southeast of the town, fired at a range of 1350 meters to systematically pound buildings identified by the infantry. The Canadians also adopted the "mousehole" technique to assault German positions and to avoid movement in the streets. "Mouseholes" were made in the upper level walls of buildings adjoining those occupied by the Germans. Teams then assaulted through the breach and cleared the building by working down from the top floor.

Ortona was finally secured on December 28. The German paratroopers withdrew to rejoin the rest of their regiment in newly established defensive positions 2 miles north of the city. The battle had been costly and the town largely destroyed.

The publicity given to the battle resulted in both sides committing more effort to the battle than would have been otherwise. Winston Churchill was moved to say that Ortona provided valuable lessons to the British army concerning combat in cities. However, these lessons were still not learned in time to defeat the same German 1st Parachute Division in its even more brilliant defense of Cassino from February to May of the following year.

#### QUANG TRI I

The battles of Quang Tri in 1972 represented a new phase in the Vietnam war. With the winter-spring offensive, the NVA initiated full-scale conventional operations with large forces. In March, three NVA divisions and several separate regiments, supported by tanks and artillery, attacked to seize Quang Tri province and Hue.

As the northernmost city in South Vietnam, Quang Tri was an easy target for the sudden attack by large forces. In this first battle two NVA divisions defeated a newly formed ARVN division. During the first four days of the offensive, monsoon cloud cover prevented effective South Vietnamese air support. Only the small and slow A1 and A37 aircraft were able to operate under the 500 foot ceiling. Even when air support later became more frequently available, the disorganized and poorly led defenders were overwhelmed. The battle within the city lasted for over a week, but was relatively one-sided.

#### QUANG TRI II

In May and June, ARVN forces began a counteroffensive to retake Quang Tri province. The city itself was approached by an airborne division moving northwards on the famous Route 1 ("Street Without Joy") while a marine division advanced along the coast. Progress was slow as the ARVN

forces attempted to annihilate the more numerous NVA defenders with superior firepower in lieu of maneuver. The subsequent battles for the city and the remainder of the province were characterized by massive air and artillery fires. Marines relieved the airborne division in front of the city in July, but an assault to take the city was not conducted until September. In the interim, bombing and shelling continued. By August 25,000 artillery rounds were being fired throughout the province every day. U.S. and South Vietnamese fighter bombers also struck targets both in and out of the city while up to 40 U.S. B52 bomber sorties daily leveled the countryside.

When the assault finally began, resistance was still sufficient to cost the ARVN forces about 150 casualties per day. The strongest defenses centered on an old 500 square meter citadel. Two hundred fighter-bomber sorties were flown against this position over a period of 6 days. Artillery also continued its bombardment. Despite this firepower, it took 5 more days to clear the defenders from the rubble.

The city and the province of Quang Tri were largely devastated. The entire campaign cost the ARVN about 2,000 killed and 9,000 wounded. NVA losses are estimated as 19,000 in killed alone.

#### SEOUL

Following the Inchon landing on September 15, 1950, U.S. forces quickly moved to recapture Seoul from the surprised North Koreans. On September 20, the 1st Marine Division began crossing to the north bank of the Han River to approach Seoul from the west. With each of its three regiments was an attached ROK marine battalion. Meanwhile the U.S. 32nd and ROK 17th regiments of the 7th Division advanced along the south bank of the river southwest of the city.

North Korean forces rushed to Seoul and hastily prepared its defense. There were about 13,000 organized North Korean troops in the vicinity of Seoul and reinforcements raised this figure to 20,000. Forces were deployed to defend the hills on the western approaches to the city. Here, outside the city, the major battle was fought.

Beginning September 21, two Marine regiments destroyed a North Korean brigade in a bitter 4 day struggle for the hills west of Seoul. The other Marine regiment eliminated an enemy regiment, along with elements of an arriving division, defending Yongdung'po, an industrial suburb 3 miles southwest of Seoul. In this latter engagement shelling and bombing of the town lasted an entire day. The artillery fire continued into the night as the remnants of the North Korean defenders withdrew. By September 24, the regiments of the 7th Division had also cleared the southern banks of the Han River below Seoul.

The Marines entered Seoul on September 25. Simultaneously, 4,900 men of the 32nd and ROK 17th regiments conducted a surprise river crossing to seize hills overlooking the city from the south. That night the North Korean forces began to evacuate Seoul. Their movement was detected and B29 aircraft dropped flares for the benefit of aircraft and artillery attacking the withdrawing forces.

The North Korean commander, however, had ordered selected units to counterattack or hold to cover the withdrawal. A 700-man force supported by 12 T34 tanks and two SP guns attacked a Marine battalion that night. Moving straight down a main boulevard, this force was decimated by an artillery barrage. Four tanks and an SP gun were destroyed, 250 troops killed, and 83 taken prisoner. Two North Korean battalions supported by tanks were equally unsuccessful in attacks against the 32nd Regiment early the following morning. (The North Koreans had a significant number of tanks available. A total of 45-50 T34 tanks were knocked out in and around Seoul. In contrast, Marine tank losses were small and all due to enemy infantry, none being lost in combat with enemy armor.)

On September 26, General MacArthur prematurely announced the liberation of Seoul. The battle, however, lasted 2 more days as the streets were cleared of North Korean barricades. This urban combat was unique in that little fighting was done in buildings. The barricades were located at key intersections and consisted of chest high walls of earth-filled bags protected by mines. A procedure was developed to assault these defenses. Corsair fighter-bombers often initially rocketed and strafed the position. While mortars and small arms provided covering fire, engineers cleared the mines. Two or 3 M26 tanks followed by infantry would then breach the barrier. Finally, the infantry would clear the area of snipers. Flamethrower tanks were occasionally used and it was by this means that the last barricade resistance was eliminated on September 27. With the clearing of mines and snipers on September 28, the battle for Seoul was over.

The fighting for Seoul had been costly. The 1st Marine Division suffered 2330 casualties, including 364 dead, in the fighting from Incheon to Seoul. Of these, 1485 were inflicted from 21-27 September, mostly in the fighting for the hills west of the city. In its advance from Incheon, the 32nd Regiment, 7th Division sustained losses of 66 killed, 272 wounded, and 47 missing. The North Korean losses were severe. The combined estimates of the 1st Marine Division and 32nd Regiment alone place North Korean casualties for the same period at greater than 16,000 in addition to the 5,995 prisoners taken by these units. The local population also suffered heavily as the North Koreans massacred thousands of civilians, mostly families of South Korean government officials, police, and military personnel. The city was also heavily damaged.

## SIDON

The port city of Sidon, as the southern headquarters of the PLO in Lebanon, was a major target for Israeli forces in their June 1982 invasion of that country. Earlier, in 1976, the PLO had inflicted significant damage on the Syrian attackers in fighting for the city. Thus, Israeli forces fully expected similar resistance.

Israeli forces bypassed and cut off Sidon in their northward advance up the Lebanese coast. Districts of the city (e.g., Ain Hilweh) known to be heavily populated by Palestinians or containing PLO facilities were pounded by artillery, naval gunfire, and aircraft. Leaflets were dropped over the entire city warning residents to leave and not harbor PLO fighters. Having already separated the major Palestinian refugee camp from the city, the Israelis launched a two-pronged assault to clear the city proper. Entering from the north, east, and south, the Israelis cleared buildings and interned all suspected PLO personnel. Resistance, however, was much lighter than expected, as the PLO had largely withdrawn northward. Such resistance mostly consisted of sniping although some positions, especially in the vicinity of Ain Hilweh, were not cleared for over a week. The Israeli attack was very deliberate. If fired upon from a building, the Israelis employed tanks and 155mm SP howitzers in direct fire to eliminate the resistance. Except where noncombatants were used as hostages by the Palestinian defenders, there were relatively few casualties among Lebanese civilians.

## STALINGRAD

The battle for Stalingrad occurred during the German summer offensive of 1942 in southern Russia. Beginning at the end of June, the offensive was to first clear the Soviet forces in the vicinity of the Don River and then make the main thrust southward to seize the oil fields in the Caucasus. Stalingrad, lying about 100 kilometers east of the great bend in the Don, was to be taken during the first phase.

Russian resistance crumbled throughout the initial advance as morale gave way and thousands deserted to cross the lines and surrender. The German Sixth Army reached the Don on July 25, but critical fuel and ammunition shortages delayed further operations. By August 18, the Germans had eliminated the stronger of two remaining Soviet bridgeheads on the Don, and had advanced to a point only 55 kilometers from the city, but were again forced to halt from exhaustion and continued supply difficulties. Meanwhile, the Fourth Panzer Army was approaching Stalingrad from the south. (Ironically, Hitler had earlier shifted this army to support the premature southern thrust and then ordered it to return. As a consequence of this move, Stalingrad, undefended in July, was bypassed and most of the Russian forces west of the Don escaped encirclement.) Meanwhile, the Russians, although still shaken, had time to reorganize their shattered forces and prepare defenses around Stalingrad. (On July 21, Stalin had decided to defend his namesake city that had earlier been given up for lost.)

Stalingrad, with a population of 500,000 and numerous factories, was one of the largest industrial centers in the Soviet Union. The inner city stretched in a 20 kilometer by 4 kilometer band along the west bank cliffs of the Volga River, the nation's chief commercial waterway. Buildings varied from stone and concrete government buildings to sprawling factories and simple wooded dwellings. Over 100 blocks of buildings occupied the center of the city which lay between two deep gorges that reached eastward to the river. The dominant terrain feature was the 330 foot high Mamaev Hill, which lies between the downtown district and the factories to the north. The hill overlooks most of the city and the river.

On August 21, the Sixth Army's LIV Panzer Corps crossed the Don with three divisions and attacked eastward to reach the banks of the Volga north of Stalingrad on the 23rd. Although the divisions became separated along the route of advance, they managed to dig in and desperately hold off Russian counterattacks over the next several days. The same day that the German spearheads reached the river, the Luftwaffe bombed Stalingrad. Six hundred aircraft, flying over 2,000 sorties, devastated the city for 2 days and killed about 40,000 civilians. (Aerial bombardment was to continue throughout the German attempts to take the city.) Two days later, a state of siege was declared and civilian evacuation ordered. It is uncertain how many civilians made it out of the city before further evacuation became impossible. In any event, Stalin was contented to leave the population in the city to serve as inspiration for the defenders.

Meanwhile the Fourth Panzer Army attacked northward and penetrated the defensive ring outside of the city, and threatened to cut off the Soviet Sixty-second and Sixty-fourth armies and destroy them west of Stalingrad. The German Sixth Army, however, failed to close the gap and 20,000 Russians escaped into the city. The Sixth Army finally attacked and by September 3 had secured the tenuous corridor to the LIV Panzer Corps and linked up with the Fourth Panzer Army which now lay on the western outskirts of Stalingrad.

Within the city, the Russians prepared a hold or die defense. With the Volga to their backs, there was no further option for retreat. Nor did the Soviet high command dare consider it. Russian commanders and the local NKVD (secret police) resorted to extreme measures to restore order among the battered remnants of units that had experienced 2 months of defeat. Many soldiers were shot as examples to their peers. The civilian population was mobilized for defense. Thousands were assigned to army units while thousands more were incorporated into a militia. In the early stages of the battle, tanks and artillery pieces produced in Stalingrad's factories were sent directly into battle, sometimes manned by factory workers. The steep escarpment along the river (up to 16 meters high) was honey-combed with tunnels for supply dumps, hospitals, and even garages. Supplies and reinforcements were ferried over the river at night to avoid air attack. Dug in artillery supported the defenders from the far shore. The city was already largely destroyed by aerial bombardment, which included incendiaries that kept parts of the city burning continuously.

During the first half of September, the Germans began the slow, costly effort to push through the streets of Stalingrad to the Volga River. On September 5, three partially trained Russian armies were hastily thrown into a poorly prepared attack against the Sixth Army north of the city. Nevertheless this desperate measure preoccupied the Sixth Army for several days. Driving through the less densely built up southern district, a battalion spearhead of the Fourth Panzer Army reached the Volga on September 10. Five more days were needed to fasten the hold on the river bank, but the Sixty-second Army was now separated from the Sixty-fourth and effectively isolated in the Stalingrad bridgehead.

On September 13, two divisions of the Sixth Army attacked into the center of the city towards Mamaev Hill and Railroad Station Number 1, near the city's central Red Square. The rail station was only 500 meters from the vital Volga ferry landing. Fifteen hundred militiamen were divided into 10-20 man "storm groups" and sent in to defend key buildings in the center of the city. These buildings became "minifortresses" commanding street intersections, each of which had to be cleared by the attacker. Fighting at such close range, the Germans were not able to effectively use air support against Russian strongpoints for fear of hitting their own troops.

Casualties mounted. In the drive toward the ferry on September 14, one German battalion lost 200 men and finished the day with 50 effectives. The following night most of the Soviet 13th Guards Division crossed the ferry and established a defensive line. It took another 6 days for the Sixth Army to cover the short distance to the river. However, the ferry lifeline, although under constant German fire, remained in Russian hands. During the next 5 days the southern part of the city was cleared by a panzer corps which had been transferred from the Fourth Panzer Army. By September 26, Red Square was occupied and by the end of the month the Russian bridgehead was reduced to an area measuring 10 by 15 kilometers.

German tactics at this stage were to send 3-4 tanks in support of an infantry company. The tanks attempted to reduce strongpoints by fire, but this was led to a high consumption of ammunition with little effect. (The largest German tank of the time, the Panzer IV, only mounted a 75mm gun, and many, if not most, tanks were armed with lesser weapons. These guns were inadequate against substantial buildings.) Furthermore, the tank guns could not be elevated to engage the upper stories of buildings from which the Russians could hurl Molotov cocktails or fire antitank rifles against the thin top armor of the tanks.

The German tanks, moving along the narrow, rubble-choked streets, were allowed to pass the defending Russian infantry and enter kill zones where they were destroyed at close range by dug in T34 tanks and antitank guns. The German infantry following the tanks would then be dealt with.

The German infantry also faced difficult problems. At night the Russians infiltrated through the labyrinth of rubble, rooftops, and cellars to reoccupy areas that the Germans had cleared the previous day. Thus, the Germans had to repeat the clearing process. As the tanks became wary, it

became necessary to employ flamethrowers to burn out the defended buildings. The casualty rate among flamethrower operators, however, was so high that special incentive pay and outright coercion were needed to man these weapons. Russian snipers, specially trained and equipped with telescopic sights, also caused considerable losses. Sniping became such an acute problem that the Germans later flew in their own sniper specialists to counter the threat.

Stalingrad had assumed its character as a "rat's war." During the successive days Mamaev Hill changed hands several times. Fighting around the hill, rail station, and Red Square was so intense that it was difficult to determine who was attacking and who was defending. Single buildings became major objectives. Both sides often occupied different parts, sometimes different floors, of the same building. Battles for these individual buildings became legendary. For 6 days less than 80 Russians held out in a grain elevator against overwhelming German forces, supported by the artillery fires of three divisions. Thirst and lack of ammunition finally ended their resistance. "Pavlov's House," an apartment house in the center of the city, was named for the sergeant who successfully led its defenders for 58 days against repeated German attacks.

German casualties were becoming critical. By the end of September, the Sixth Army had lost 7,700 killed, 30,200 wounded, and 1,100 missing since crossing the Don in August. This was 10 percent of its total strength and a far greater proportion of its combat strength since the losses were suffered by front-line troops, particularly the infantry. Infantry losses were so high that the Germans reported that intensive attacks could not be sustained and the battle could therefore continue indefinitely. In one division, infantry battalion average strengths were down to 3 officers and 73 men. Ammunition was also running low. In September alone the army had fired three-quarters of a million artillery shells and 25 million small arms rounds.

The Russians were likewise bleeding. The 13th Guards Division, for example, lost about 8,000 of its 10,000 men. Replacement rates barely kept pace with casualties. By the end of September, Stalingrad's defenders numbered about 53,000. During that month the Sixty-second Army had lost about 80,000 in dead, wounded, and missing. The Russians, however, were willing to continue reinforcing the defense to hold Stalingrad at any cost. From mid-September to early October nine rifle divisions, two tank brigades, and a rifle brigade crossed the Volga and entered the city.

By the end of September the Sixth Army had accomplished its strategic objective. The Volga waterway was severed, half of Stalingrad was in German hands, and the rest under fire. Hitler, however, became as obsessed with taking the city as Stalin was in holding it. After a lull to resupply and receive some reinforcements, including five assault engineer battalions, the Sixth Army renewed its attack on October 14.

The next 2 weeks of fighting have been described as the most bitter of the battle. Within 2 days the Germans, fighting with greater skill than previously, seized the northern tractor factory and reached the Volga

to split the Russian bridgehead in two. In the first three days the Russians lost about 13,000 men, nearly a quarter of the defending force. Massed Soviet artillery responded from the far bank, shelling the entire German line. Despite successes the attacks ultimately were halted in bloody battles throughout the factory district. By November, high casualties and ammunition shortages again insured the momentum of the attack could not be sustained. In early November, however, the winter freeze set in. Drifting ice on the Volga prevented the ferry operations on which the Sixty-second Army depended. The Russians had been further reduced to two bridgeheads, one 10 kilometers wide and a 2.5 kilometers deep within the city, the other in the northern suburbs was half that size. On November 11, the Germans broke through to the river in the northern end of the larger bridgehead and isolated a Soviet division. Hitler urged "one more all out attempt," but the German offensive against Stalingrad was over. (The analysis of the battle for the purposes of this study ends at this point.)

On November 19, the Soviets launched a major offensive. From bridgeheads on the northern bend of the Don, the Russians ripped through the Third Rumanian Army while in the south they folded up a Rumanian Corps of the Fourth Panzer Army. (Most of this army's German divisions had been detached to the Sixth Army.) The two arms of this gigantic pincer closed behind the Sixth Army and elements of the Fourth Panzer Army on November 22. The commander of the Sixth Army requested permission to break out of the encirclement, but refused to take the initiative without Hitler's approval. Two days later Hitler ordered the army to stand at Stalingrad and promised to supply it by air with 300 of the needed 600 tons daily. The Luftwaffe, however, struggled to reach a daily average of less than a third of that, losing 500 aircraft in the process. As the situation grew desperate, the German's forces outside the pocket, in serious straits themselves, were finally able to launch a relief effort. With two, later three, divisions, this force attacked for a week to reach a point 55 kilometers from the city on December 19. The Sixth Army, short on fuel and with its soldiers weakened by malnutrition, was unable to make the effort to link up with the relieving force. A few days later Russian reinforcements drove back the relief force. Meanwhile, on December 16, a new Russian effort further to the north disintegrated the Italian Eighth Army and threatened to trap all the German forces in southern Russia. In a brilliant series of withdrawals and counterattacks, the Germans successfully withdrew from the Caucasus and by March 1943, finally stabilized the line held before the 1942 offensive.

The Sixth Army at Stalingrad, however, was doomed. Starving, freezing, diseased, and lacking fuel and ammunition, it continued to hold out. The only value to this sacrifice was that Russian armies were being tied up while the Germans repaired their front 325 kilometers to the west. On January 10, the Don Front, with seven armies totaling 281,000 men and 250 tanks began the final assault on the Sixth Army. Five of these armies had been in combat since mid-summer and this total force was 150,000 men understrength. The Russians gradually overran the resupply airfields and split up the Germans within the pocket, expending 911,000 artillery shells and 990,000 mortar rounds in the effort. On February 2, 1943, the Germans surrendered and the battle for Stalingrad ended.

The Germans had lost 20 divisions totaling over 200,000 men. The exact figure is unknown, although more recent Soviet figures list German casualties as 147,200 killed and wounded, and 91,000 taken prisoner. Additionally, over 30,000 wounded were flown out during the battle. The Soviets have never made their own losses public, but they were certainly high and probably far exceeded the Germans in terms of dead and wounded. Civilian losses are also unknown, but their scope is indicated by a post battle census that located only 1,515 of the original 500,000 inhabitants. Although many civilians were evacuated, many thousands died during the battle. The city, including its 41,000 homes and 300 factories, was totally destroyed.

Stalingrad was one of the decisive battles of World War II and of all history. With the exception of the ill-fated Kursk offensive in the summer of 1943, the Germans were now permanently placed on the defensive. The Russians having reversed a steady streak of defeats since 1941, were now confident of their ability to carry the war to victory.

#### SUEZ CITY

The battle of Suez City occurred in the closing days of the October 1973 Mideast War. Israeli forces having crossed the Suez Canal, sought to expand their territorial gains before the imminent arrival of United Nations Truce Supervisory Organization (UNTSO) observers enroute to implement the cease fire agreement. Seizing Suez City would complete the encirclement of the Egyptian Third Army trapped on the east bank and establish Israeli claims for control of the area.

Suez City lies on the west bank at the strategic south entrance to the canal. Two thirds of its pre-1967 population of approximately 250,000 had been evacuated as a result of artillery exchanges prior to the 1973 war. The city consists of several distinct sectors. To the southwest of the central city lies an industrial area with its adjacent port area to the south. A 1.5 kilometer long causeway extends from the southeast corner of the city to two other ports on an island within the bay. Building construction varies from the predominant 2-3 story mud and stucco residences to 5-8 story reinforced concrete apartment buildings. The main thoroughfares are very broad with Route 33 running through the center of the city separating buildings on opposite sides by up to 75 meters. By contrast, the side streets between the closely packed residential buildings are often little more than narrow alleys.

Suez City was well prepared for defense even before the war began. The city possessed a trained 2,000 man militia led by retired army officers. Minor routes into the city were blocked by mines and rubble obstacles while major routes were prepared for demolitions. Demolitions were used to clear fields of fire to create kill zones on main roads. Centralized communications and supply points were established. These existing measures were further improved as battle became imminent. Regular Egyptian forces defending the city at the time of the battle included elements of several units with an aggregate strength equivalent to two mechanized infantry battalions plus an antitank company and a few T54/55 tanks.

The Israelis committed two armored brigades to capture the city. These brigades did not have their organic infantry, but were reinforced with two company-sized paratroop "battalions," an armored infantry battalion, a scout company, and a company-sized reconnaissance "battalion." There were a total of 108 tanks and 102 half-tracks and APCs in these forces. Fire support was provided by three artillery battalions including a 175mm SP gun battalion firing from the east bank.

The Israelis had only 6 hours to begin execution of the operation before arrival of the UNTSO observers. The plan was consequently simple. Encirclement of the city was to be completed. Then under the cover of air strikes and artillery fires the two brigades would take up positions and conduct a mounted assault into the city. At this time the influential Israeli armor branch had developed its own MOUT doctrine. It was believed that tanks and APCs could successfully take urban areas using mounted shock tactics to penetrate the defenses with guns blazing, seizing key points from which mopping up operations could be conducted against the disorganized defenders. The 217th Brigade would attack from the north and drive southeast along Route 33 to seize three key road intersections within the city. The final objective was the road junction at the port causeway. The 460th Brigade would attack in the south driving east to clear the industrial and port sectors and link up with the 217th at the causeway junction.

The operation began on the morning of October 24. The air strikes were not as intensive as had originally been planned due to misty weather and an order to clear the area before arrival of the UN observers. Considerable damage, however, was created by 10-20 sorties that included one-ton bombs. Following the air strikes, the 217th Brigade's attack quickly bogged down on the northern outskirts in the face of Sagger missile, tank, and antitank gun fires. Here they stopped to await the hastily attached infantry. The 460th Brigade meanwhile drove east through the port and industrial areas against little resistance.

The 217th Brigade remained stalled for about 2 hours until it integrated the infantry. Because of the difficulties of reorganizing the force under fire, the infantry and armor elements were positioned in a 2.5 kilometer-long column as pure units and not organized as teams. The advance continued at high speed into the city. A low concrete wall on either side of railroad tracks down the center of the road prevented movement from one street lane to another. Thus, the axis of penetration was narrower than anticipated. Due to the speed of the advance, gaps developed between units.

As the lead armor battalion entered the second of the three road intersection objectives it was met by devastating fire. The Egyptians engaged with Sagger missiles, RPGs, ZU-23 AA guns, antitank grenades thrown from balconies, and small arms. All the tank commanders in the lead battalion were killed or wounded. Disabled vehicles blocked the road. Vehicles veering into the narrow side streets often became trapped. The survivors of the leading armor force reformed and pressed on to its other objectives. Meanwhile, the following paratroop "battalion" dismounted 500

meters from the kill zone. The deputy brigade commander succeeded in persuading them to remount their vehicles, but shortly thereafter they entered the kill zone and faced the same withering fire. Again they dismounted and secured buildings in the vicinity of the intersection. The reserve paratroop "battalion" also dismounted and continued on foot until it came under fire. They, too, took positions in nearby buildings. The final group in the column, the brigade scout company, withdrew from the city after taking heavy casualties.

By 11:00 a.m. the 460th had achieved its objective, while the 217th had elements on all three objectives, but were surrounded and under fire. The next 12 hours were spent attempting to extricate the scattered elements of the brigade. In an attempt to relieve the pinned down forces, the 217th committed another armored battalion that had initially covered the entrance into the city. This battalion was forced to withdraw in the face of heavy antitank fires. Meanwhile the population of the city joined in a popular war, barricading side streets, destroying disabled vehicles, and carrying supplies to the combatants.

Air strikes were also requested, but had to be redirected at the ports across the causeway because the precise locations of the 217th Brigade could not be identified. A battalion of the 460th succeeded in linking up with the 217th at the causeway junction where it was attached to the 217th commander. Another reconnaissance battalion and tank company from another brigade north of the city was also placed under the commander of the 217th Brigade. This latter force entered on a new axis and was unable to locate the forces trapped at the first kill zone. As they withdrew to the northwest they located the reserve paratroops and evacuated their wounded. By dusk the Israelis had withdrawn from the causeway junction, leaving only the two groups of paratroopers in the center city. The paratroopers escaped undetected during the night, with the last reaching Israeli lines about 5 a.m. on October 25.

The battle left the Israelis in control of the ports and industrial areas and the Egyptians in control of the central city. The Israelis admitted losses of 88 killed and taken prisoner and 28 armored vehicles destroyed. Ten more Israeli tanks were destroyed in probing actions on the following day. Egyptian losses are unknown, but are believed to have been slight.

#### TEL ZAATAR

The siege of the Palestinian camp of Tel Zaatar was part of the Lebanese Christian forces 1976 campaign to rid their heartland of the Moslem threat. Tel Zaatar was the most important of a chain of fortified refugee camps lying just east of Beirut. The 74 acre camp housed about 20,000 residents in 13,000 dwellings. These buildings were mostly concrete and stone with corrugated steel roofs. The camp was bordered on the south and west by multistory buildings of an industrial area and an apartment district respectively. The foothills of Mount Lebanon dominated the camp on the northern and eastern perimeter.

Palestinian defenders numbered about 1,500 at the beginning of the siege, but rapidly declined from casualties, withdrawals, and defections. Christian forces numbered about 1,800 men -- mostly members of various militias, but also including about 300 from the Lebanese Army. These numbers, however, fluctuated based on the intensity of the fighting and the requirements of the separate militias. Only the Lebanese Army personnel remained throughout the entire period of the siege. Both sides possessed various mortars, recoilless rifles, and antiaircraft guns up to 57mm. The Christian forces also had several armored vehicles including "Super Sherman" tanks as well as some 122mm and 155mm howitzers. The Palestinians had only four tanks, but possessed several multiple rocket launchers.

The Christians first laid siege to Tel Zaatar on January 1, 1976. This initial effort was largely a blockade of food and medical supplies. Once the battle lines in Beirut began to stabilize at the end of March, the Christians were able to mass for the takeover of Tel Zaatar and its sister camps. However, disagreements between Christian factions, the Muslim/leftist offensive to take Mount Lebanon, and a series of cease fires and mediation agreements, delayed implementation of plans to seize Tel Zaatar. Meanwhile, a number of families had fled from the camp. Increasing tensions between the Syrian sponsored Saiqa forces and other Palestinian groups resulted in the former also abandoning the camp. The PLO, however, reinforced the camp and stockpiled supplies for the coming battle. A network of tunnels and bunkers was also constructed throughout the camp.

On June 22, the Christians launched their first major attack on Tel Zaatar and other nearby camps. The high ground overlooking the camp was taken on the 28th. Meanwhile, as the conflict intensified, Syrian forces lent tacit approval to the Christian effort by not interfering to halt the fighting. By July 1, two other camps had fallen and Tel Zaatar was completely encircled. Shelling destroyed most of the temporary dwellings and heavily damaged some of the industrial buildings on the southern perimeter. The extensive tunnel network, however, provided the defenders effective shelter and covered movement routes. Christian attacks gradually forced the Palestinians into a tightening perimeter. As they fell back, the defenders abandoned most of their mortars and antiaircraft guns. By July 5, the Palestinians occupied strongpoints around several tall buildings within the camp.

During the next several days the Palestinians continued to hold out against Christian shelling and intermittent assaults. Families, including fighters, continued to flee the camp. The Red Cross organization, present throughout the fighting, often succeeded in negotiating the evacuation of the wounded also.

The Christian forces began the final assault on August 10. This was primarily a Lebanese Army directed operation. Under the cover of an artillery and mortar barrage, tanks, armored cars, and APCs spearheaded the advance of the infantry. Two army-led columns broke into the camp while a third militia group conducted a blocking operation. Fierce fighting broke out as the attackers reached the buildings of the inner perimeter. The following day, the Christian forces pressed home the assault. Mines and

rubble deterred the armor from advancing further. The "Super Sherman" tanks and Panhard armored cars continued to provide direct fire against positions in the upper levels of the two- and three-story buildings. The final defenses, however, were cleared by infantry supported by 106mm and B10 85mm recoilless rifles along with RPG rocket launchers. In certain cases, drums of jellied gasoline and explosives were rolled against walls and detonated by time or remote-controlled fuzes. The defense perimeter was reduced to an area between 200 x 500 and 400 x 800 meters and the last remaining water source was captured. Only 300 defenders remained in the camp along with thousands of civilians. On the morning of August 12, the last organized resistance was overwhelmed.

An accurate casualty count is impossible, but the death toll, particularly among civilians, had been high. Over 8,000 artillery and mortar rounds had fallen on the camp destroying most of the temporary buildings, but causing only medium to light damage to the multistory residential and industrial buildings. Twelve thousand refugees were evacuated after the fall of the camp.

#### TYRE

Like Sidon and Beirut II, the battle for the port city of Tyre occurred during the Israeli 1982 offensive against the PLO in Lebanon. Although Tyre had come under frequent Israeli air and artillery attacks between 1979 and 1981, it still contained substantial numbers of PLO forces among a majority Shi'a population that was hostile to both Israel and the PLO.

Operations against Tyre were similar to those against Sidon. The city was bypassed and cut off during the major thrust up the coast. Leaflets and loudspeakers warned the inhabitants to leave the city or move to the beaches and to avoid sheltering of, or proximity to, PLO personnel. The city, lying predominantly on a peninsula, was quickly isolated by an amphibious landing in the north. Israeli forces then moved in from several directions. The defenders' artillery outside the city was destroyed by airstrikes. Major pockets of resistance were hit by aerial bombardment and naval gunfire in support of the ground attack.

The defenders were surprised by the scale of the operation and offered slight and very uncoordinated resistance, although individual pockets of Palestinians resisted for almost a week. The Israelis conducted aggressive reconnaissance and clearing operations. Fire was deliberately drawn from the defenders and then overwhelming firepower was brought to bear on the located position. Tanks and direct-fire artillery were extensively used in this firepower role. The combined use of air, ground, and naval fires in the city, however, was carefully controlled and major damage was limited to concentrated areas of resistance.

## ZAHLE

The battle for control of the city of Zahle evolved from skirmishes between Syrian troops and the resurgent Christian Lebanese. By the spring of 1981, conflict at Zahle was a well developed facet of the nationwide confrontation between Syrian troops of the Arab Deterrent Force and the Christian Lebanese Forces (LF). To the Syrians Zahle was a threat to their control of the vital supply lines of the Damascus-Beirut highway and the north-south road through the strategic Beqa'a Valley. The Christians initially saw the value of Zahle in similar terms, but as the fighting progressed the town became significant for its psychological value. The plight of Zahle was used in an attempt to secure Israeli military intervention, and more generally, foreign, particularly U.S. diplomatic involvement.

Zahle, with a population of 100-110 thousand (increased to 120-150 thousand by refugees prior to the battle), lies at the foot of some of Lebanon's highest mountains and opens onto the plain of the Beqa'a Valley. During the period of skirmishing both sides began reinforcing their forces and constructing fortifications. The LF dispatched about 200 trained troops and assisted in arming and training 2,500-3,000 residents. Much of the remainder of the civil population served as auxiliaries who aided the fighters by carrying supplies, operating the dispensaries, fighting fires, etc. Weapons included RPG rocket launchers, 106mm RRs, at least 2 Milan ATGMs, and a variety of mortars up to 120mm, although these latter had limited ammunition. Artillery support in the early stages was provided by LF 130mm and 155mm weapons located in the surrounding mountains. Trench lines were constructed near the outskirts of the city that extended about 8 kms in length by the end of the battle and contained a bunker about every 50 meters. Defensive sectors were designated along neighborhood lines, with the traditional family leaders in charge of their sectors. LF forces provided the backbone of the defense and were shifted as necessary to meet a threatening attack.

The Syrians also constructed fortifications on the mountains overlooking the city. Reinforcements were also brought in. Within two weeks after the fighting began the Syrians had 7 special forces battalions, 2 armored battalions, 1 rocket launcher battalion, and significant amounts of conventional artillery poised against Zahle. Six additional brigades of varying types, totaling 20,000 troops, were operating within 10-20 km of the town.

Major fighting erupted on April 1, 1981, when LF troops attacked an approaching Syrian unit. At least two T55 tanks were knocked out and a bridge on the outskirts was captured. Subsequent Syrian counter-attacks suffered additional losses. The Syrians heavily shelled the town in response. This and subsequent shellings failed in their purpose of intimidating Zahle's residents into ending their support to the LF.

The battle of Zahle was a prolonged siege. The Syrians were unwilling to accept the high casualties that an assault might incur and sought to achieve a decision by isolating the city and subjecting it to artillery bombardment. By April 14, the Syrians had succeeded in an offensive to eliminate LF positions in the surrounding mountains. This operation effectively cut the mountain footpaths used to supply Zahle. Syrian efforts in Zahle itself consisted of applying pressure through heavy shelling and intermittent armored thrusts to secure the north-south road. These latter actions were poorly coordinated and unimaginative. Following an artillery barrage, several tanks, sometimes with APCs, would attack in a column two or three abreast and unsupported by dismounted infantry. An attack by the defender's antitank weapons usually inflicted losses and discouraged further progress. The Soviet-built BMP infantry fighting vehicle proved particularly vulnerable to the RPG in these engagements. The Syrians, however, did effectively employ snipers equipped with the SVD sniper rifle. Syrian antiaircraft guns placed on the upper floors of buildings proved both destructive and intimidating due to their high volume of concentrated, relatively heavy caliber fire.

The pattern of intermittent artillery shelling, limited thrusts, and cease fires was to continue throughout the siege. (Interestingly, about 100 Syrian troops were trapped in two buildings in the center of the city when the battle began. They remained throughout the siege. By not eliminating these Syrian positions, the LF effectively held them hostage. The Syrians' need to resupply these troops led to negotiations that allowed the Red Cross and other organizations into the city.)

By early June, the defenders were being worn down. Water, electricity, food, medicine, and ammunition were in short supply. Several thousand refugees had evacuated the city. A negotiated settlement led to LF withdrawal from Zahle on June 30. Christian casualties are estimated at 300 and Syrian casualties are unknown.

Syria had won a tactical victory, but the strategic outcome favored the LF. The LF psychological warfare operations had successfully promoted world attention on Lebanon and the U.S. had become actively involved indirectly as a result of the Zahle fighting. (In the latter part of April the Syrians had deployed SA-6 missiles in the Beqa'a Valley to counter the threat of Israeli air intervention. Confrontation between Israel and Syria over the missile issue led to U.S. involvement in the negotiations. When the U.S. negotiating team was suddenly diverted from the "missile crisis" to negotiating an Israeli-PLO cease fire, the U.S. became unforeseeably involved to a degree that mandated U.S. participation in future settlements.)

**APPENDIX B**  
**STATISTICAL SUMMARY OF CASES**

# STATISTICAL SUMMARY OF CASES

Battles: 22

Battles by year:

1942  
Stalingrad\*\*

1943  
Ortona\*

1944  
Aachen\*  
Arnhem†  
Cherbourg\*

1945  
Berlin\*  
Manila\*

1950  
Seoul\*

1967  
Jerusalem\*

1968  
Hue\*

1972  
Quang Tri I\*  
Quang Tri II\*

1973  
Suez City†

1975  
Ban Me Thout\*  
Beirut I‡

1976  
Tel Zaatar\*

1978  
Ashrafiyeh†

1980  
Khorramshahr\*

1981  
Zahle†

1982  
Beirut II\*  
Sidon\*  
Tyre\*

1962-1967 - 9  
1968-1982 - 13

\* Attacker Wins - 16  
† Defender Wins - 5  
‡ Draw - 1

N.B. A "win" is defined as a conflict outcome such that the "winner" is the party controlling the contested area at the conclusion of hostilities.

\*\* For the purposes of this study, Stalingrad is evaluated during the German offensive phase only, i.e., Aug-Nov 1942.

# BATTLES PROFILE

Superiority in:										
Battle	Air	Armor	Artillery							
Aachen	A	A	A	1:3	Local	P	Y	2	U	A
Arnhem	NCS	D	D	1.5:1	Alien	N	N	1	U	D
Ashrafiyeh	None	A	A	10:1	Local	N	N	1	L	D
Ban Me Thout	D	A	A	7.5:1	Local	P	Y	1	U	A
Beirut I	None	D	NCS	5:3	Local	N	N	5	L	Draw
Beirut II	A	A	A	3:1	Local	P	N	1	U	A
Berlin	A	A	A	4.5:1	Local	Y	Y	1	U	A
Cherbourg	A	A	A	3:1	Alien	P	Y	1	U	A
Hue	A	A	A	4:5	Alien	P	Y	1	U	A
Jerusalem	A	A	A	1.5:1	Local	P	N	2	L	A
Khorramshahr	NCS	A	NCS	4:1	Local	P	N	1	U	A
Manila	None	A	A	2.5:1	Alien	P	Y	1	U	A
Ortona	A	A	A	3:1	Alien	N	Y	3	U	A
Quang Tri I	D	A	A	3:1	Local	N	Y	1	U	A
Quang Tri II	A	NCS	A	3:5	Alien	N	Y	1	U	A
Seoul	A	A	A	3:1	Alien	N	Y	1	U	A
Sidon	A	A	A	4:1	Alien*	Y	N	1	U	A
Stalingrad	A	A	A	2:1†	Local	N	Y	1	U	D
Suez City	A	A	A	1:5	Local	P	N	3	U	D
Tel Zaatar	None	A	NCS	1:1	Local	Y	N	3	L	A
Tyre	A	A	A	4:1	Alien*	Y	N	1	U	A
Zahle	None	A	A	15:1	Local	P	N	3	L	D

A - Attacker

D - Defender

Draw - No clear decision

NCS - No clear superiority

None - Air power not employed

Local - Defender is of same nationality and culture as bulk of populace

Alien - Defender is of nationality or culture different from bulk of populace

P - Partial

N - No (Defense not cut off or significant casualties unacceptable to attacker)

Y - Yes (Defense cut off or significant casualties acceptable to attacker)

\* - PLO treated as distinct from bulk of (Lebanese) populace

† - Force ratio changes in favor of defender as battle progresses

Force Size: 1 = 10,000 total aggregate personnel engaged

2 = 5,000 - 10,000

3 = 2,500 - 5,000

4 = 1,000 - 2,500

5 = 1,000

L - Limited

U - Unlimited

TABLE B1a  
Outcome with Attacker Air Superiority (n = 13)

	1942-1967	1968-1982	1942-1982
Attacker Wins	6	5	11
Defender Wins	1	1	2

TABLE B1b  
Outcome with Defender Air Superiority (n = 2)

	1942-1967	1968-1982	1942-1982
Attacker Wins	0	2	2
Defender Wins	0	0	0

TABLE B1c  
Outcome with No Clear Air Superiority (n = 2)

	1942-1967	1968-1982	1942-1982
Attacker Wins	0	1	1
Defender Wins	1	0	1

TABLE B2a  
Outcome with Attacker Armored Superiority (n = 19)

	1942-1967	1968-1982	1942-1982
Attacker Wins	7	8	15
Defender Wins	1	3	4

TABLE B2b  
Outcome with Defender Armored Superiority (n = 2)

	1942-1967	1968-1982	1942-1982
Attacker Wins	0	0	0
Defender Wins	1	0	1
Draw	0	1	1

TABLE B2c  
Outcome with Attacker >5:1 Tank Advantage (n = 15)

	1942-1967	1968-1982	1942-1982
Attacker Wins	6	5	11
Defender Wins	0	3	3
Draw	0	1	1

TABLE B3a  
Outcome with Attacker Artillery Superiority (n = 18)

	1942-1967	1968-1982	1942-1982
Attacker Wins	7	7	14
Defender Wins	1	3	4

TABLE B3b  
Outcome with Defender Artillery Superiority (n = 1)

	1942-1967	1968-1982	1942-1982
Attacker Wins	0	0	0
Defender Wins	1	0	1

TABLE B3c  
Outcome with No Clear Artillery Superiority (n = 3)

	1942-1967	1968-1982	1942-1982
Attacker Wins	0	2	2
Defender Wins	0	0	0
Draw	0	1	1

TABLE B4a  
Outcome when Attacker Enjoyed Force Ratio of  $\geq$  4:1 (n = 7)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	4	5
Defender Wins	0	2	2

TABLE B4b  
Outcome when Attacker Enjoyed Force Ratio of  $\geq$  2:1 (n = 14)

	1942-1967	1968-1982	1942-1982
Attacker Wins	5	6	11
Defender Wins	1	2	3

TABLE B4c  
Outcome when Attacker Enjoyed Force Ratio of  $<$  2:1 (n = 8)

	1942-1967	1968-1982	1942-1982
Attacker Wins	2	3	5
Defender Wins	1	1	2
Draw	0	1	1

TABLE B5a  
Outcome when Defense is Cut Off (n = 4)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	3	4
Defender Wins	0	0	0

TABLE B5b  
Outcome when Defense is Partially Cut Off (n = 10)

	1942-1967	1968-1982	1942-1982
Attacker Wins	4	4	8
Defender Wins	0	2	2

TABLE B5c  
Outcome when Defense is not Cut Off (n = 8)

	1942-1967	1968-1982	1942-1982
Attacker Wins	2	2	4
Defender Wins	2	1	3
Draw	0	1	1

TABLE B6  
Outcome when Attacker Casualty Risk is Unacceptable (n = 11)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	5	6
Defender Wins	1	3	4
Draw	0	1	1

TABLE B7  
Outcome when Defender is "Alien" (n = 9)

	1942-1967	1968-1982	1942-1982
Attacker Wins	4	4	8
Defender Wins	1	0	1

TABLE B8a  
Outcome with Attacker Air & Armor Superiority (n = 12)

	1942-1967	1968-1982	1942-1982
Attacker Wins	6	4	10
Defender Wins	1	1	2

TABLE B8b  
Outcome with Attacker Air & Artillery Superiority (n = 13)

	1942-1967	1968-1982	1942-1982
Attacker Wins	6	5	11
Defender Wins	1	1	2

TABLE B8c  
Outcome with Attacker Air & Overall Force Ratio  $\geq$  4:1 Superiority (n = 3)

	1967-1982	1968-1982	1942-1982
Attacker Wins	1	2	3
Defender Wins	0	0	0

TABLE B8d  
Outcome with Attacker Air, Armor, Artillery, &  $\geq$  4:1 Force Ratio Superiority (n = 3)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	2	3
Defender Wins	0	0	0

TABLE B8e  
Outcome with Attacker Air, Armor, Artillery, &  $\geq$  2:1 Force Ratio Superiority (n = 8)

	1942-1967	1968-1982	1942-1982
Attacker Wins	4	3	7
Defender Wins	1	0	1

TABLE B8f  
Outcome with Attacker Air & Armor Superiority but Casualty Risk is Unacceptable (n = 5)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	3	4
Defender Wins	0	1	1

TABLE B8g  
Outcome with Attacker Armor Superiority but Casualty Risk is Unacceptable (n = 9)

	1942-1967	1968-1982	1942-1982
Attacker Wins	1	5	6
Defender Wins	0	3	3

TABLE B9  
Outcome by Engagement Size (n = 21)

Force Size (Thousands)	1942-1967			1968-1982			1942-1982		
	2.5-5	5-10	>10	2.5-5	5-10	>10	2.5-5	5-10	>10
Attacker Wins	1	2	4	1	0	8	2	2	12
Defender Wins	0	0	2	2	0	1	2	0	3

TABLE B10a  
Outcome by Type of Combat (n = 22)

	<u>Unlimited Combat</u>	<u>Limited Combat</u>
Attacker Wins	14	2
Defender Wins	3	2
Draw	0	1

TABLE B10b  
Type of Combat by Era

Era	<u>Unlimited</u>	<u>Limited</u>
1942-1967	8	1
1968-1982	9	4

TABLE B11  
Battles in Which City Combat Affected Overall Campaign

<u>Battle</u>	<u>Effect</u>	<u>Magnitude*</u>	<u>Battle "Winner"</u>	<u>Alternate† Winner</u>
Aachen	Adverse for Attacker	Minimal	Attacker	--
Arnhem	Adverse for Attacker	Great	Defender	--
Beirut II	Adverse for Attacker	Great	Attacker	Defender
Cherbourg	Adverse for Attacker	Limited	Attacker	Defender
Hue	Adverse for Attacker	Considerable	Attacker	Defender
Khorramshahr	Adverse for Attacker	Great	Attacker	Defender
Manila	Adverse for Attacker	Minimal	Attacker	--
Ortona	Adverse for Attacker, Defender	Minimal	Attacker	--
Stalingrad	Adverse for Attacker	Decisive	Defender	--
Suez City	Adverse for Attacker	Limited	Defender	--
Tel Zaatar	Adverse for Attacker	Limited	Attacker	--

\* The effect of combat on the overall campaign

† Alternative "winner" based on achievement of objectives

TABLE B12  
Duration of Combat by Battle (n = 22)

<u>City (Outcome)</u>	<u>0-24 hours</u>	<u>25-48 hours</u>	<u>&gt;48 hours to 5 days</u>	<u>6-13 days</u>	<u>14-30 days</u>	<u>&gt;30 days</u>
AACHEN (A)					X†	
Arnhem (D)				X		
Ashrafiyeh (D)						X*
BAN ME THUOT (A)		X				
BEIRUT I (Draw)						X*
BEIRUT II (A)						X
BERLIN (A)					X†	
Cherbourg (A)				X†		
HUE (A)					X	
JERUSALEM (A)			X			
KHORRAMSHAHR (A)					X	
MANILA (A)					X	
Ortona (A)				X		
Quang Tri I (A)				X		
Quang Tri II (A)						X
SEOUL (A)				X†		
SIDON (A)			X			
STALINGRAD (D)						X
SUEZ CITY (D)	X					
Tel Zaatar (A)						X
Tyre (A)			X			
ZAHLE (D)						X*

NOTE: Cities in all capital letters have a pre-war population of 100,000 or more.

\* Intermittent days of combat over a period of days (Ashrafiyeh: 14 of 37 days; Beirut I: 64 of 195 days; Zahle: 41 of 80 days).

† Consideration of only the urban combat phase of these battles would place them in the lower preceding category.

TABLE B13  
Outcome by Duration (n = 22)

<u>Winner</u>	<u>0-24 Hours</u>	<u>25-48 Hours</u>	<u>&gt;48 Hours to 5 days</u>	<u>6-13 Days</u>	<u>14-30 Days</u>	<u>&gt;30 Days</u>
Attacker	0	1	3	4	5	3
Defender	1	0	0	1	0	3
Draw	0	0	0	0	0	1

TABLE B14  
Duration by City Size (n = 22)

<u>City Size</u>	<u>0-24 Hours</u>	<u>25-48 Hours</u>	<u>&gt;48 Hours to 5 days</u>	<u>6-13 Days</u>	<u>14-30 Days</u>	<u>&gt;30 Days</u>	<u>Total</u>
<100,000	0	0	1	4	0	3	8
>100,000	1	1	2	1	5	4	14

TABLE B15  
Outcome by Size (n = 22)

<u>Outcome</u>	<u>&lt;100,000</u>	<u>&gt;100,000</u>
Attacker Wins	6	10
Defender Wins	2	3
Draw	0	1

TABLE B16  
Outcome by City Size & Duration of Constant\* Combat (n = 19)

	<u>&lt;100,000</u>			<u>&gt;100,000</u>		
	<u>1-5 Days</u>	<u>6-30 Days</u>	<u>&gt;30 Days</u>	<u>1-5 Days</u>	<u>6-30 Days</u>	<u>&gt;30 Days</u>
Attacker Wins	1	3	2	3	6	1
Defender Wins	0	1	0	1	0	1

\* Ashrafiyeh, Beirut I, and Zahle excluded as intermittent.

TABLE B17  
Outcome by Attacker Doctrine (n = 19)

	<u>1942-1967</u>		<u>1968-1982</u>		<u>1942-1982</u>	
	<u>Soviet</u>	<u>U.S.</u>	<u>Soviet</u>	<u>U.S.</u>	<u>Soviet</u>	<u>U.S.</u>
Attacker Wins	2	5	6	3	8	8
Defender Wins	0	1	1	0	1	1
Draw	0	0	0	1	0	1

TABLE B18a  
Employment of Defensive Concepts

	<u>1942-1967</u>	<u>1968-1982</u>	<u>1942-1982</u>
Defense in depth	6	7	13
Defense of Key Objectives	7	9	16
Mobile Defense	3	4	7
Defense of Avenues of Approach	7	8	15

TABLE B18b  
Outcome by Defense

Outcome	1942-1967				1968-1982			
	<u>In-Depth</u>	<u>Key Objectives</u>	<u>Mobile</u>	<u>Avenue of Approach</u>	<u>In-Depth</u>	<u>Key Objectives</u>	<u>Mobile</u>	<u>Avenue of Approach</u>
Attacker Wins	5	6	1	5	5	7	2	5
Defender Wins	1	1	2	2	2	1	1	3
Draw	0	0	0	0	0	1	1	0

<u>Summary</u>	<u>In-Depth</u>	<u>Key Objectives</u>	<u>Mobile</u>	<u>Avenues of Approach</u>
Attacker Wins	10	13	3	10
Defender Wins	3	2	3	5
Draw	0	1	1	0

TABLE B19a  
Combat Duration\* by Force Ratio (A:D)

<u>Duration</u>	<u>≥ 4:1</u>	<u>Force Ratio</u> <u>&gt;1.5:1 = 3:1</u>	<u>= 1.5:1</u>
0-23 Hours			1
25-48 Hours	1		
48 hours - 5 days	2		
6-13 Days		4	1
14-30 Days	3	1	2
30 Days	1	3	2

\* Combat days only: Ashrafiyeh - 14 days; Beirut I - 64 days; Zahle - 41 days

TABLE B19b  
Average Combat Duration by Force Ratio, A:D, (Combat Days Only)

<u><math>\geq 4:1</math> (n = 7)</u>	<u><math>&gt;1.5:1 \leq 3:1</math> (n = 8)</u>	<u><math>\leq 1.5:1</math> (n = 7)</u>
14	33	21

TABLE B19c  
†Average Combat Duration by Force Ratio, A:D,  
(Excluding Siege Battles)

<u><math>\geq 4:1</math> (n = 5)</u>	<u><math>&gt;1.5:1 \leq 3:1</math> (n = 7)</u>	<u><math>\leq 1.5:1</math> (n = 5)</u>
9	33	21

†Siege battles not considered: Ashrafiyeh, Beirut I, Beirut II, Tel Zaatar, Zahle

## APPENDIX C

### HYPOTHESES

## HYPOTHESES

The hypotheses included here were generated as an early activity of the research and were based upon observations in previous studies of these and other cases. The hypotheses were not however readily testable as they were by their nature general statements. For example, hypothesis 3 states that "exfiltration and internal movement . . . are relatively easy at night." What does "relatively easy" mean? We therefore placed each hypothesis into more operationally dichotomous terms so that a "yes" or "no" would suggest that data existed to confirm or deny the hypothesis. Sometimes, this required a series of statements in place of one. These statements, which were used for data collection purposes, were called "operational hypotheses."

For each battle a response sheet ("Data Sheet") was prepared with dichotomous answers (plus an unknown/not applicable cell) and a "comments" line available for virtually all questions. Where sources were particularly abundant (e.g., Stalingrad), several data sheets were initially used, then aggregated into one sheet.

Frustration of several early attempts to use the data sheet was largely attributable to the idiosyncratic nature of each battle. Thus, in trial runs, the "comments" line quickly filled with caveats or factors that tended to be battle characteristics but that were believed by the data collector to be critical to understanding the outcome of the battle in its proper context. Specifically, the sheer disparity of forces often seemed decisive, but this had not been entered as a hypothesis.

Thus, we developed a Battle Facts sheet to accompany the Data Sheet. This Battle Facts sheet was designed to provide basic information on the size and armament of opposing forces, on duration of combat, the era of the battle, and on some other factors that might significantly affect the nature of hostilities and that appeared to be inherently (and sometimes implicitly) related to the objectives of the project.

It will come as no surprise to the reader that the quality and quantity of data varied markedly across cases. Even in World War II cases, some (e.g., Aachen) were covered effectively while others (e.g., Ortona) enjoyed much less systematic coverage. Across battles, Ortona yielded the fewest responses (16), and Sidon and Tyre the greatest number (60). Similar disparities took place across questions: 22(1) received only 9 responses, while 16, and some others, had the maximum 22 responses.

Another problem of a different character arose in some cases, especially those abundantly covered in the literature--discrepancies. Sometimes a question might be answered in two ways because of the fact that a battle is really a group of many small actions. In other cases, different authors simply described battles differently, disagreeing about issues covered in the hypotheses. As the data collection progressed, neither of these problems proved significant or frequent, but both

occurred. We chose to take the dominant behavior in response to the first problem. In almost every case, one answer or another was reported by the bulk of the literature when there was a conflict, and this was the response taken in respect to the second problem.

In terms of organizing and analyzing the data, the number of responses to individual queries was too few (maximum n of 22) to generate statistically significant findings, particularly when data moved into subcategories to investigate changing behavior over time. Consequently, the language of the report reflects the fact that case selection, case number, and other factors necessitate an impressionistic analysis in which we endeavored to apply reasonable rigor to the data.

We determined too that rather than produce a report that merely investigated hypothesis 1, hypothesis 2, and so forth, the analysis should be organized around certain subjects that brought together a number of individual hypotheses and also permitted generalizations concerning the dominant factors in outcome, since most hypotheses were only tangentially related to outcome. In addition, we sought to determine whether the data suggested tactical changes over time, and comparing related hypotheses seemed a more reasonable measure of face validity than considering individual hypotheses only.

Thus, individual hypotheses are all addressed under the several categories (engagement, tactics, armor, artillery, air power, outcome). For example, use of indirect-fire artillery to prepare an area is covered under artillery (esp. p. 30).

In order to pay particular attention to dominant factors in outcome, most of the data in Appendix B are related to outcome. However, outcome was used as a dependent variable only for some purposes, and as the text shows, prevalence of specific tactics, changes over time, and other variables were also used extensively.

The hypotheses include:

1.

a. Whereas the defensive forces have many advantages in MOUT--viz., a chance to select from numerous positions with natural cover, and familiarity with a complex terrain--the eventual outcome will generally "favor" the offense in the sense that a fixed position can always be taken with adequate maneuvering forces.

b. Alternatively, the cost in time, casualties and resources will generally favor the defender if the defender takes advantage of all the anomalies of MOUT.

2. Columns moving into a new built-up area tend to become lost. Individuals in combat become confused by the two-dimensional plane and need to elevate themselves inside high buildings to discern the general layout.

3. Exfiltration and internal movement within a city by small groups are relatively easy at night.

4. There is no technique to preclude reentry of cleared buildings by the enemy.

5. The prepping of an area with indirect-fire artillery prior to attacking seems to produce little effect and may increase the problem of house-clearing due to the induced disarray of building interiors caused by the bombardment.

6. Public utility assets are generally not used optimally.

7. Small shock units are organized for attack on specific areas. An integral part of the team is direct-fire support from tanks or self-propelled artillery.

8. Wall breaching, an artillery direct-fire role, is a constant problem giving rise to innovation and "jury-rigging."

9. Combatants fire large weapons from inside buildings regardless of health hazards.

10. "Key Buildings" are generally not the focal point of combat, but combat takes place near key buildings.

11.

a. Defensive positions evolve into a bastion of several peripheral buildings surrounding a strong central building.

b. The purpose of this type of defensive strongpoint is to defend a key target.

12. Defensive positions built around key bridges and intersections are set up to obstruct enemy movement.

13. Bypassing defensive strongpoints is a mistake in an urban environment.

14. When a strongpoint is met by the offense, attempts are made to reduce it by "systematic workover" by direct-fire support weapons. If this fails, or when direct-fire support is limited, innovative encroachment by outflanking (e.g., through walls of adjacent buildings or over roofs) is attempted to further threaten the strongpoint.

15. In delaying operations, basement hold-out positions are used in a manner similar to snipers. The advantage of the basement position is extensive cover. The disadvantage is lack of flexibility in movement.

16. There seems to be a general futility for an infantry unit to attack a strongpoint without heavy direct-fire support.

17. Artillery contributes most in a direct-fire role where it is uniquely valuable.
18. Delay fuzing is important in the employment of artillery as a direct-fire weapon in MOUT.
19. Air defense artillery is singularly valuable in cities both for destroying building exteriors and for arresting assaults.
20. Mortars are used more heavily than other artillery in MOUT.
21. Indirect-fire from both artillery and organic mortar units seems to have greatest use in the defensive role against troops moving across streets and open areas. Apart from this application, mortars below 140mm are of limited utility.
22. Assault fire/assault guns have a potential role in MOBA/MOUT.
23. Maintaining proximity to the enemy precludes his recourse to air power or artillery.
24. Artillery and air power have critical roles to play on the outskirts of built-up areas and to the rear of the battlefield area in interdicting supply, evacuation, and reinforcement.
25. "Strategic bombardment" by air or artillery has little effect on major cities—on either the psychology or the capabilities of the defenders.
26. The use of roving antiarmor teams operating from a defensive position will provide considerable problems for offensive operations.
27. Armored columns attempt to burst through a built-up area "all guns blazing."
28. Standard issue military field communications do not operate well in cities for a variety of reasons (some having little to do with performance capabilities of the system).
29. Sniping is always a significant problem in urban combat.
30. Snipers are usually found 2-3 stories below the top floor in high buildings.
31. Organized city defenses always employ sniper teams.

Operationalized hypotheses include:

- 1a.       Offense (attacker) won.
- 1b.(1)   Cost in time for attacker was high.
- 1b.(2)   Cost in casualties for attacker was high.
- 1b.(3)   Cost in resources for attacker was high.

- 2 (1) Attacking column became lost.
- 2 (2) Individuals tried to elevate selves to see general layout.
- 3 (1) Exfiltration occurred at low cost.
- 3 (2) Internal movement occurred at low cost.
- 4 One side reentered "cleared" buildings, or was unsure whether "cleared" buildings was still secure.
- 5 (1) Indirect artillery preparatory fires did not significantly disrupt defenders.
- 5 (2) Indirect artillery preparatory fires made house-clearing more difficult for attackers by damaging structures.
- 6 (1) Attacker did not use water effectively.
- 6 (2) Attacker did not use power effectively.
- 6 (3) Attacker did not use telephone effectively.
- 6 (4) Defender did not use water effectively.
- 6 (5) Defender did not use power effectively.
- 6 (6) Defender did not use telephone effectively.
- 7 (1) Small shock units were organized for attack on specific areas.
- 7 (2) Direct-fire support from tanks or SPA is organic to the units.  
(Note whether tanks or SPA in "comments.")
- 8 (1) Breaching walls was a problem.
- 8 (2) Techniques were used other than direct-fire artillery.  
(Name them in "comments.")
- 9 Combatants fired large weapons from inside buildings.  
(Note idiosyncrasies of buildings, if any, in "comments."  
Also note health results, if known.)
- 10 (1) Key buildings were not the focal point of combat.
- 10 (2) Combat took place near or around key buildings.
- 11a. Defensive positions became a bastion of several peripheral buildings around strong central building.
- 11b. This type of strongpoint was used to defend a key target.
- 12 (1) Defensive positions developed near a key bridge or intersection.
- 12 (2) This type of defensive position was established to obstruct offensive movement.
- 13 (1) Bypassing defensive strongpoints led to cost in time.
- 13 (2) Bypassing defensive strongpoints led to cost in casualties.
- 13 (3) Bypassing defensive strongpoints led to cost in resources.

- 13 (4) Bypassing defensive strongpoints led to cost in achievement of objectives.
- 14 (1) Offense attempted to reduce strongpoint through systematic workover by direct-fire support weapons.
- 14 (2) If (1) failed, offense attempted to outflank the strongpoint.
- 15 Basement hold-out position was used.
- 16 Infantry attack on strongpoint without heavy direct-fire support failed.
- 17 (1) Artillery used in direct-fire role played useful role.
- 17 (2) Artillery used in direct-fire role played less useful role.
- 18 Direct-fire artillery used delay fuzing.
- 19 (1) ADA (AAA) was used to denude building exteriors and suppress sniper fire.
- 19 (2) ADA (AAA) was used to stop assaults down streets.
- 20 Mortars were used more than other artillery.
- 21 (1) Indirect artillery and mortars were used to harass and disrupt the movement of troops moving across the streets and open areas.
- 21 (2) Mortars below 140mm were not effective in other uses.
- 22 (1) Assault fire was used or attempted.
- 22 (2) Assault guns were available.
- 23 (1) One side endeavored to stay close to the other in order to preclude air or artillery harassment.
- 23 (2) Maintaining proximity precluded recourse to air power to artillery.
- 24 (1) Artillery played an important role in interdicting supplies, evacuation, and reinforcement just outside built-up areas and to rear.
- 24 (2) Air power played an important role in interdicting supplies, evacuation and reinforcement just outside built-up areas and to rear.
- 25 (1) Strategic bombardment did not significantly erode defenders' will to resort.
- 25 (2) Strategic bombardment did not significantly erode defenders' capabilities.
- 26 (1) Roving AT teams were used.
- 26 (2) These teams gave offensive units significant problems.

- 27        Armored columns attempted to go with built-up area "all guns blazing."
- 28 (1)    Communications problems were encountered.
- 28 (2)    These problems related to command and control, maintenance, or other factors not connected with systems performance.
- 29 (1)    Sniping was used by attackers.
- 29 (2)    Sniping was used by defenders.
- 29 (3)    Sniping caused considerable problems for the offense.
- 30 (1)    Snipers were located 2-3 stories below the top floor in high buildings.
- 30 (2)    Snipers were located on top of high buildings.
- 30 (3)    Snipers were located near the ground.
- 30 (4)    Snipers were most effective \_\_\_\_\_.